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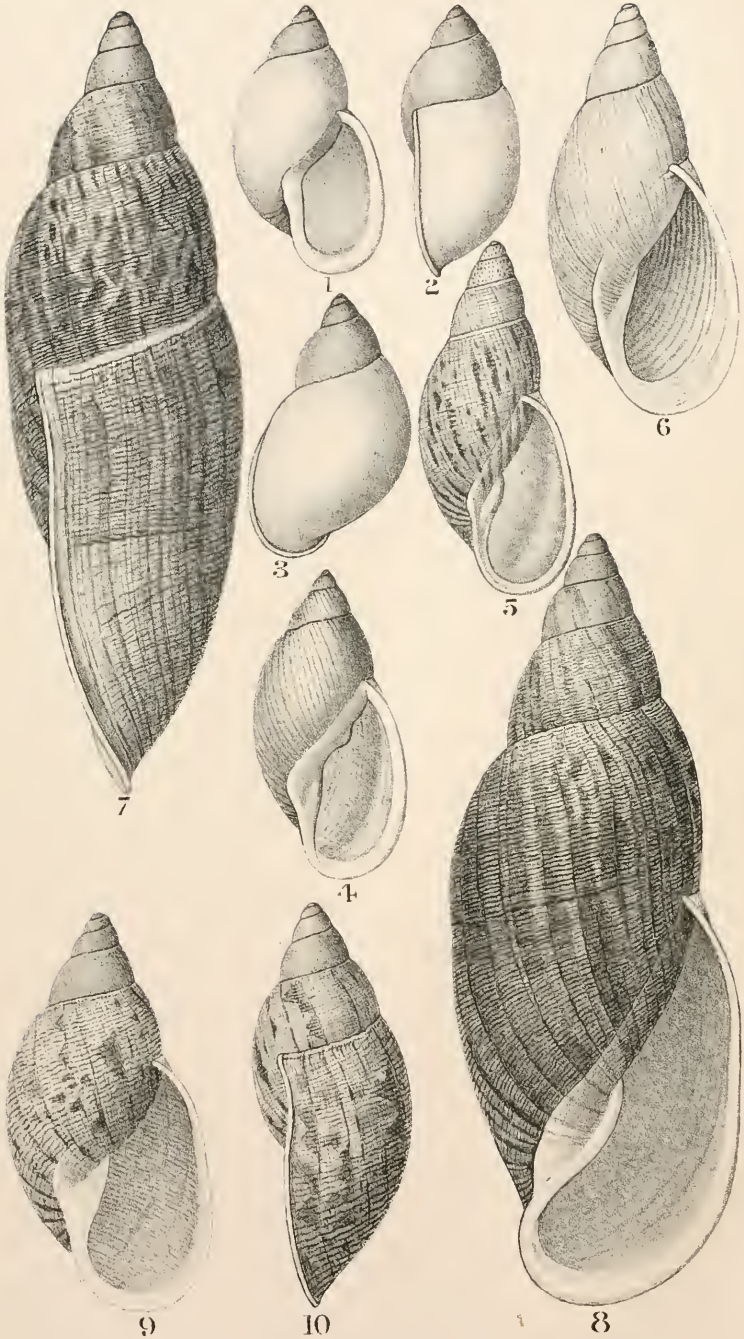

SECOND SERIES: PULMONATA.

MANUAL

OF

CONCHOLOGY

STRUCTURAL AND SYSTEMATIC.

WITH ILLUSTRATIONS OF THE SPECIES.

FOUNDED BY

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Vol. XIII.

AUSTRALASIAN BULIMULIDÆ: BOTHRIEMBRYON, PLACOSTYLUS.
HELICIDÆ: AMPHIDROMUS.

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1900.

THE present volume contains only Oriental and Australasian Bulimi, of the families *Bulimulidæ* and *Helicidæ*. The classification of Pulmonates is now in a transitional stage, and it was impossible to see, a few years ago, that the genus Bulimus would become merely a name suggestive of a certain shell-contour, and standing for no natural group. Hence, some genera which should have been intercalated in the Helicid series were left for treatment with the *Bulimulidæ*. *Amphidromus*, a genus undoubtedly belonging among the epiphallogonous *Helicidæ*, near *Papuina*, *Chlorites*, etc., thus finds place in this volume.

The genera *Bothriembryon* and *Placostylus* are true *Bulimulidæ*, allied to the South American series. This family is a typically "Austral" group.

In the preparation of this volume I have received material assistance from Dr. J. C. Cox, Prof. W. H. Dall, Prof. F. W. Hutton, Mr. Charles Hedley, and Mr. H. Suter, who have supplied specimens or notes bearing on *Bothriembryon* and *Placostylus*. Specimens of *Amphidromus* have been received from Messrs. C. F. Ancey, G. H. Clapp, John Ford, John B. Henderson, Jr., Chas. W. Johnson and H. E. Sargent, and Mr. Hugh Fulton favored me with colored figures of some forms of which only uncolored illustrations had been published. To all of these gentlemen my most hearty thanks are due.

H. A. P.

Philadelphia, November, 1900.

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MANUAL OF CONCHOLOGY.

Vol. XIII—*BULIMULIDÆ*—(*Bulimulinæ*).

Genus BOTHRIEMBRYON Pilsbry, 1894.

Bothriembryon Pils., Nautilus viii, p. 36 (July, 1894), type *B. melo*.

Liparus Martens in Albers, Die Heliceen, 1860, p. 229, type *B. inflatus* Lam. (Proposed as a subgenus of *Bulimulus* Ehrenb.). Pfeiffer–Clessin, Nomencl. Hel. Viv., 1878, p. 282.

Not *Liparus* Albers, Die Heliceen, 1850, p. 172 (for *B. atomatus* and *favannii*), nor Pfr., Malak. Bl., 1855, p. 157 (*B. atomatus*, *favannii*, *crassilabris*), nor of H. & A. Adams, Gen. Rec. Moll., ii, p. 133 (as a subgenus of *Limicolaria*). Not *Liparus* Olivier, Entomologie, ou Hist. Nat. des Insectes, vol. v, pp. 73, 283, 1807 (Coleoptera).

Australian *Bulimulidæ* with ovate- or oblong-conic shell of moderate solidity or thin, perforate or closed umbilicus, and simple unexpanded outer lip; the columellar lip dilated or reflexed, not calloused or folded; apex with $1\frac{1}{2}$ to 2 whorls finely pitted, like a thimble, or vertically wrinkled or costellate, the subsequent whorls differently sculptured.

The jaw is arcuate and plaited, the median segment triangular or wedge-shaped. Radula about as in *Bulimulus*. Genital system simple, much as in *Bulimulus*.

The sculpture of the apex (plate 4) varies considerably, passing from a pattern of subvertical wrinkles, which may be close and waved (*gunni*, *onslowi*), or more spaced (*spenceri*), to wrinkles so much crimped as to anastomose and form a network (*gratwicki*, first whorl of *inflatus*); thence the transition to a regular pitted pattern (as in *conispira*, *kingi*, *dux*) is by gradual and easy steps. This series of changes is almost exactly paralleled in the American genus *Bulimulus*; and as in that genus, the vertically wrinkled pattern is prob-

ably the primordial sculpture; the finely netted or thimble-like pattern of *kingi* and its allies having been derived therefrom. *B. gunni* and *B. spenceri* retain the ancestral nepionic sculpture, and are exactly like some American species in pattern.

The nepionic sculpture of *B. physoides, brazieri, bulla, baconi, angasianus* and *mastersi* is unknown to me.

The name *Liparus*, by which this group has been known hitherto, was originally proposed for *B. atomatus* Gray, a species of *Panda*, and *B. fauraunii* Lam., the type of the later genus *Leucotænius*. Pfeiffer and the Adams brothers retained the group in Albers' sense; but in von Martens' edition of Albers' Die Heliceen, the type is stated to be *B. inflatus* (a species not in the group as at first constituted), and *Liparus* is subordinated to *Bulimimus*, following the erroneous theory that the *Bulimulus* group was not represented in the Eastern Hemisphere. Were *Liparus* a valid name in Mollusca, it would supersede *Leucotænius* or *Panda;* but being long preoccupied for a genus of weevils, it need occupy us no longer. The name *Bothriembryon* refers to the pitted sculpture of the shell within the egg.

The species are confined to the southern portion of Western Australia, with the exception of a few forms following the coast eastward along South Australia, and a species in Tasmania. Tropical Australia (the Northern Territory of South Australia and Queensland), and eastern Australia (New South Wales and Victoria), are without representatives of the genus.

That the group is an immigrant from South America seems to be the only tenable hypothesis to account for its geographic location and *Bulimulus*-like characters. Like the Bulimuli of Argentina, the shell in *Bothriembryon* has retained the simple ancestral form, probably because of the perpetuation of the terrestrial, or at all events non-arboreal, habits of its South American forefathers. The *Placostylus* branch of the same stock, under the influence of subtropical conditions, has meantime become greatly modified in its later stages of growth, while the stage of infancy remains nearly unchanged.

The most prolific group of species is that of *B. inflatus;* and here the specific lines are more than usually arbitrary. Hedley groups *melo, physoides, castaneus, bulla* and *rhodostoma* under *B. inflatus* as varieties. Perhaps this may be a more synthetic treatment than present knowledge warrants; but it is significant of the broad range

of variation and the indistinctness of lines of demarkation between the various nascent species.

Reeve quotes *Bulimus obtusus* from Australia, but this is an error for *Austria* (Conch. Icon. species 583).

B. DUX (Pfeiffer). Pl. 3, fig. 62.

Shell large, narrowly and partly covered umbilicate, ovate, solid and strong, opaque, pale flesh-tinted. Surface lustreless, sculptured with irregular growth wrinkles, decussated by spiral incised lines on the spire. Spire conic, the apex small, earlier $1\frac{3}{4}$ whorls densely and finely pitted, the pits arranged in more or less regular vertical rows. Whorls 6, but slightly convex, the last one large and oblong.

Aperture ovate, but slightly oblique, the interior, columella and parietal wall of a pale purple tint; outer lip simple, blunt; columella broadly reflexed above.

Alt. 52, diam. 29, longest axis of aperture 30–31 mill.

South coast of Western Australia: *King George Sound* (Masters); *Israelite Bay* (Shackleford); 50 miles E. of *Israelite Bay* (Cox); *Fraser Range* (Elder Exped.).

Bulimus dux PFR., P. Z. S. 1861, p. 24; Malak. Bl. 1861, p. 15; Monogr. vi, p. 108.—COX, Monogr. Aust. Land Shells, p. 71, pl. 13, f. 4; pl. 18, f. 16.—BEDNALL, Trans. Roy. Soc. South Australia, xvi, p. 66 (1892).—*Bulimnus dux* Pfr., SHACKLEFORD, Journ. of Conchology, ix, no. 7, p. 219 (July, 1899).—*Bulimus* (*Liparus*) *dux* Pfr., E. A. SMITH, Proc. Malac. Soc. Lond. i, p. 94.

The largest species of the genus.

B. INFLATUS (Lamarck). Pl. 1, figs. 1–5.

Shell narrowly umbilicated, of a compact ovate form, rather solid, white under a thin straw-yellow cuticle, unicolored, or with a small brown umbilical patch, and often a brown band below the suture; sometimes with irregularly spaced brown longitudinal streaks and some buff striæ. Surface rather shining, irregularly but not strongly striated longitudinally, obsoletely decussated on the spire, and sometimes showing a few faint decussating spirals below the suture of the last whorl. $1\frac{1}{2}$ to $1\frac{2}{3}$ apical whorls low, the first one sculptured with rather coarse oblique wrinkles, more or less anastomosing, and changing on the last half whorl to a subregular and increasingly finer pitted pattern (pl. 4, fig. 72, 73, 74). Spire short, convexly

conic; apex obtuse. Whorls 5 to $5\frac{1}{2}$, slightly convex, the last oval, ventricose.

Aperture ovate, but slightly oblique, white within; peristome simple and acute; columella well reflexed, white or purple brown.

Alt. 23.5, diam. 15.5, longest axis of aperture 14.8 mill.

Alt. 29, diam. 18, longest axis of aperture, 18 mill.

Alt. 23.5, diam. 14.5, longest axis of aperture, 13.4 mill.

Western Australia: *King George Sound* (Quoy & Gaimard, Masters); *Freemantle* (Bacon); *between Victoria Spring* and *Fraser Range*, and *Fraser Range* (Elder Exped.).

Bulimus inflatus Lam., An. s. Vert., vi, pt. 2, p. 122 (April, 1822).—Delessert, Recueil, pl. 28, f. 1.—Pfr., Monogr. ii, p. 189; iii, p. 418; iv, p. 478; vi, p. 124.

? *Helix* (*Cochlogena*) *costulata* Fér., Prodr., p. 54 (nude name).—? *Bulimus costulatus* Pot. & Mich., Galerie, i, p. 138, pl. 12, f. 17, 18.—? *Bulimus inflatus* Reeve, Conch. Icon., pl. 70, f. 512.

Helix melo Quoy & Gaimard, Zool. Voy. Astrolabe. ii, p. 109, pl. 9, f. 4, 5 and Var., 6, 7 (1832).—*Bulimus melo* Deshayes in Lam., An. s. Vert. viii, p. 245, with var. *castaneus*.—Sowerby, Beechey's Voy. H. M. S. "Blossom," p. 145, pl. 38, f. 16.—Menke, Moll. Nov. Holl., p. 7.—Pfr., Monogr. Hel. Vic. ii, p. 188; iii, 418; iv, 477; vi, 124; viii, 160.—Cox, Mon. Australian Land Shells, p. 74, pl. 13, f. 6.—Bednall, Trans. Roy. Soc. South Australia, xvi, pt. 1, p. 66 (1892).—*Bulimulus melo* Beck, Index Moll., p. 68.—Semper, Reisen im Archip. Phil., Landmoll., iii, p. 154, pl. 15, f. 14 (genitalia), pl. 17, f. 13 (teeth).—*Orthalicus melo* Tapparone Canefri, Viaggio int. al globo della R. Fregata "Magenta," Malacologia, p. 86.—*Bulimus* (*Liparus*) *melo* E. A. Smith, Proc. Malac. Soc. Lond., i, p. 94.—*Helix melones* Ferussac, Prodr. p. 54 (nude name).—*Bulimus melones* Potiez & Michaud, Galerie des Moll. Mus. de Douai, i, p. 147, pl. 13, f. 15, 16.—*Bulimus orum* Quoy, Deshayes, in Le Règne Animal, edit. par une réunion de disciples de Cuvier, Moll., pl. 23, f. 1 a, 1 b (shell), 1 c, d, exterior and internal anatomy). (Published prior to 1838; this name never used by Quoy).

The typical *B. inflatus* is distinguished from the ordinary forms of "*B. melo*" by its more compactly ovate form, the spire being less conic, by the lighter interior, and less variegated color-pattern, and by having the striæ almost uncut by spiral lines on the last whorl,

while in several varieties grouped under *B. melo* there should be quite a wide granose belt below the suture. This varies by imperceptible degrees.

Figures 1, 2, are copies of Delessert's figures of Lamarck's type. My artist has exaggerated the vertical streaks a good deal. Figures 3, 4, represent what I take to be the typical form of the species, being drawn from specimens from King George Sound. Figure 5 represents the largest specimen I have seen, drawn from a shell in Dr. J. C. Cox's collection.

The citation of *Helix costulata* Fér. as a synonym rests solely upon Lamarck's authority. I have doubts of the shell figured as *inflatus* by Reeve.

Var. *melo* (Quoy & Gaimard). Pl. 1, figs. 7, 8, 9, 10.

Similar to *B. inflatus*, but with numerous irregularly spaced reddish-brown streaks running with the growth-lines, and usually with some whitish longitudinal threads in their intervals; often having a dark subsutural band and umbilical patch. Aperture light (not white) and streaked within, columella purple-brown or tinted.

The merest color-variety, admitted here chiefly because the name is in ordinary use. Quoy and Gaimard distinguish a variety of *melo*, described below, which differs in the darker color and white cincture.

Figures 9, 10, are the typical *melo* of Q. & G. Figures 7, 8, are specimens from King George Sound.

Var. *castaneus* Desh. (pl. 1, figs. 11, 18). Less inflated than *B. inflatus*; length about 22–25 mill.; *purplish-chestnut, with a light belt above, and more or less numerous whitish striæ;* granulation below the suture of the last whorl weak or almost obsolete. King George Sound. This form is but weakly differentiated from the streaked variety *melo* of *B. inflatus.*

Alt. 23, diam. 12.5, longest axis of aperture 12.5 mill.

Alt. 22, diam. 13, longest axis of aperture 12.5 mill.

King George Sound (Q. & G.) *and Recherche Archipelago* (Dr. Cox).

This is Quoy and Gaimard's "*varietas castanea, vitta alba cincta,*" figures 6, 7 of the Astrolabe Zoology (my figure 11).

Var. *maculiferus*, n. v. (pl. 1, figs. 12, 13, 14). Larger, alt. 28–32 mill.; purplish-chestnut copiously streaked and maculated with whitish; no light belt; the aperture dark; more or less granose

below the suture and on the spire. Whorls $5\frac{1}{2}$ (*B. melo* Reeve, Conch. Icon. pl. 39, f. 243, is this form).

Alt. 28, diam. 17, longest axis of aperture 16.5 mill.

Alt. 31.5, diam. 19, longest axis of aperture 18 mill.

King George Sound.

Figure 13 is from a specimen in coll. Dr. J. C. Cox.

Fig. 14 represents a very solid, cretaceous form with conspicuous subsutural granulation and purplish aperture, the exterior mainly white. Alt. 23, diam. 15, longest axis of aperture 14 mm. It is from Dr. Cox's collection, precise locality not known.

Var. CONISPIRA, n. v. Pl. 1, figs. 15, 16, 17.

Length 22 to 25 mill.; last whorl wide; spire more conic; densely marked with opaque white or yellow striæ on a reddish-brown or pale amber ground, often with an ill-defined light belt above; the aperture purplish-fleshy or somewhat ochraceous within. Surface distinctly striated, *conspicuously granose below the suture*, which is more or less conspicuously marginate. Apex with more elevated whorls than *B. inflatus* or the preceding varieties, distinctly reticulated throughout, the pits of the net-work arranged in more or less distinct vertical rows; an abrupt change of sculpture at inception of the post-nepionic stage (pl. 4, fig. 71).

Alt. 25, diam. 14.5, longest axis aperture 13 mill.

King George Sound.

Fig. 17 shows a form in which there is a very broad light zone extending from the periphery to near the umbilicus. Fig. 15 is an albino, with white aperture.

The difference in the nepionic sculpture between this form and *B. inflatus* is considerable, the present variety more nearly resembling *B. dux* in this respect.

B. SPENCERI (Tate). Pl. 1, figs. 19, 20.

Shell narrowly perforate, broadly ovate, thin and not strong, chestnut brown lightening in places to yellowish, uniform except for some inconspicuous darker streaks. Surface shining, sculptured with low, irregular growth wrinkles, which near the suture and on the spire are cut into granules by spiral incised lines. Spire very short, the apex obtuse, somewhat involute at the tip; nepionic $1\frac{1}{2}$ whorls delicately sculptured with "oblique, slightly raised, wavy threads, narrower than the interspaces," and running vertically (pl.

45, fig. 1, a young shell of $2\frac{1}{2}$ whorls, and 4.3 mill. greatest diameter, showing nepionic shell and first whorl of the neanic stage, with spiral cuticular threads); the succeeding whorl showing fine raised cuticular spirals in young, unrubbed shells. Whorls slightly over 4, quite convex, the last one inflated.

Aperture oblique, ovate, brown within; outer lip thin and simple, the columella rather broadly reflexed above, nearly closing the perforation.

Alt. 19, diam. 13.5, longest axis of aperture 11.3 mill.

Alt. 17.6, diam. 13, longest axis of aperture 11.3 mill.

Alt. 20, diam. 12.5, longest axis of aperture 11.5 mill. (type).

Central Australia: *Glen of Palms, by the junction with Palm Creek*, burrowing in loose earth under the shade of fig trees (Tate).

Liparus spenceri TATE, Trans. Roy. Soc S. Australia, xviii, p. 192 (1894); Rep. Horn Exped. to Central Australia, pt. 2, Zoology, p. 202, pl. 18, f. 13 (1896).—HEDLEY, t. c., p. 226, f. N (jaw), O (teeth), P (genitalia).

Similar in shape to the short and broad variety of *B. inflatus*, but differs by its thin shell, more convex whorls, and oblique, wider aperture, as well as by the entirely different sculpture of the embryonic whorls, which resembles that of *B. gunni*, though the riblets are much more widely spaced. The figures are from part of the original lot, kindly sent by Professor Ralph Tate.

B. KINGII (Gray). Pl. 2, figs. 21 to 28.

Shell narrowly perforate, oblong-ovate, the diameter varying from slightly more than half, to less than half the length of the shell; thin, sometimes strong and solid but usually weak and brittle. White, cream-tinted below, sparsely or copiously streaked with strongly contrasting dark chestnut stripes, or with pale, grayish, translucent stripes; rarely uniform straw tinted, or with the stripes split into lines; a dark umbilical patch generally present. Surface hardly shining, rather irregularly striated, the striæ stronger near the suture, somewhat decussated by spiral incised lines on the spire, but not so on the last whorl. Spire long, conic, the apex obtuse, corneous, $1\frac{3}{4}$ to over 2 earlier whorls with pitted sculpture, the pits very fine, distinct, arranged in longitudinal rows (pl. 4, figs. 77, 78). Whorls $5\frac{1}{2}$ to $5\frac{3}{4}$, slightly convex, the last either tapering or somewhat saccate below. Aperture small, white or purplish-brown

within, and more or less variegated; outer lip simple and acute, columellar lip dilated above, *white.*

Alt. 21.5, diam. 11.5, longest axis of aperture 12 mill.

Alt. 22.5, diam. 11, longest axis of aperture, 11.3 mill.

Alt. 28, diam. 13, longest axis of aperture, 13.4 mill.

Alt. 30.5, diam. 13, longest axis of aperture, 14.5 mill.

Alt. 1, diam. $\frac{1}{2}$ inch (Gray).

Western Australia: *King George Sound*, abundant on the hills in the vicinity of Bald Head (King, Quoy and Gaimard, Masters).

Bulimus kingii Gray, Ann. of Philos. (n. ser.) ix, 1825, p. 414.—Reeve, Conch. Icon. pl. 51, f. 336.—Pfr., Monogr. ii, p. 174; iii, p. 410; iv, p. 468; vi, p. 111; viii, p. 148.—Cox, Monogr. Australian Land Shells, p. 75, pl. 13, f. 7.—*Helix kingii* Wood, Index Testac., Suppl., pl. 7, f. 27.—*Bulimus* (*Liparus*) *kingii* Gray, E. A. Smith, Proc. Malac. Soc. London, i, p. 95.—*Helix trilineata* Quoy and Gaimard, Zool. Voy. Astrolabe, ii, p. 107, pl. 9, f. 1–3 (1832).—*Bulimus trilineatus* Deshayes in Lam., An. s. Vert. viii, p. 248; in Fér. Histoire, pl. 150, f. 11, 12.—Reeve, Conch. Icon., pl. 59, f. 397; pl. 48, f. 310.—Pfr., Monogr., ii, p. 174; iii, 412; iv, 471; vi, 114; viii, 152.—M. E. Gray, Figs. Moll. Anim. pl. 74, f. 2 (copied from Quoy).—*Bulimus sayi* Pfr., P. Z. S. 1846, p. 114.—Reeve, Conch. Icon., pl. 65, f. 458.—*B. quoyi* Cox, Catal. Australian Land Shells in coll. J. C. Cox, M. D., p. 23, based on *Helix trilineata* Quoy (1864).—*Orthalicus quoyi* Cox, Tapparone-Canefri, Viag. "Magenta," p. 87.

Much more elongated than *B. inflatus*, *melo*, and the allied forms, the diameter and long axis of aperture being about half the total length of the shell. The exceptionally large, high, and very finely pitted nepionic shell is characteristic. No subspecies can be distinguished with present knowledge, but there are several well-marked variations.

Figures 21 to 26 represent the typical form, of which *B. trilineatus* (figs. 25, 26, type) and *B. sayi* (fig. 24, type) are synonyms. It varies chiefly in the number and intensity of the stripes, which vary from deep chestnut to translucent gray.

Fig. 29 is drawn from a King George Sound specimen (Dr. Cox's collection) of a straw yellow color, varied only by a small dark umbilical crescent.

Fig. 27 represents a large specimen from King George Sound (Cox collection), which is quite swollen, not tapering, below.

Fig. 30 is a small specimen from Cape Naturalist. There are 5 whorls, the last inflated below, almost imperforate. It is beautifully streaked with opaque, glossy white on a corneous and purplish-brown ground. Alt. 20, diam. 11, longest axis of aperture 10.7 mill. The aperture is decidedly more oblique than in the typical form from King George Sound. It is not unlikely that this will prove a geographic race or variety. From the Cox collection.

Var. *solidus*, n. var. Fig. 28 represents a very solid, strong, opaque shell, with $5\frac{3}{4}$ whorls, the aperture less than half the alt. The surface is dull, rough, and obscurely streaked with ochraceous and purplish on a dirty white ground. It is from Western Australia, exact habitat unknown. The type is in Dr. J. C. Cox's collection.

The entire series is remarkable for the beautifully distinct pitting of the nepionic shell, which has a fraction of a whorl more than usual in the genus. The last nepionic whorl is quite high, and more or less variegated on the latter part.

B. PHYSOIDES (Reeve). Pl. 2, figs. 35, 36, 37.

Shell ventricosely ovate, thin, inflated, scarcely umbilicated. Whorls 5, longitudinally roughly striated, plicately crenulated at the sutures; columella reflected, lip simple, yellowish, mottled with white. (*Reeve.*)

Western Australia (Mus. Cuming.)

Bulimus physoides Menke MSS., REEVE, Conch. Icon. pl. 70, f. 507 (July, 1849).—*B. physodes* Menke MSS., according to Pfr.—*Bulimus* (*Liparus*) *physoides* Reeve, E. A. SMITH, Proc. Malac. Soc. Lond. i, p. 95, pl. 7, f. 30 and var., f. 31, (including *B. brazieri* as a variety).

"This species has been considered by Pfeiffer and Cox a variety of *B. melo*. I am inclined to think that it is sufficiently distinct for specific separation. It is of thinner texture, not quite as broad and robust, has a thinner white columella with a purplish brown zone around the closed umbilical region. In *B. melo* the umbilicus is slightly open, the columella more thickened, more reflexed, and of a purple-brown tint, and there is no basal zone of that color. In the latter character *B. kingii* agrees with the present species, but is more elongate in form.

"The variety *brazieri* is rather more coarsely granular than the typical form, but agrees in other respects.

"Another variety (pl. 2, fig. 37) is like the type, excepting in color. It is of a rich purple-brown, with only a few irregular streaks of creamy-white, and a sub-basal yellowish band, which appears quite white within the aperture." (*E. A. Smith.*)

Var. BRAZIERI (Angas). Pl. 2, figs. 38, 39, 40.

Shell oblong-ovate, thin, straw-color, frequently with reddish-brown, irregular spots and flames, and sometimes nearly all brown; longitudinally rugosely plicately ribbed and transversely striated, the intersections strongly granular, whorls 5, rather convex, sutures impressed. Aperture ovate; outer lip thin; columella nearly straight, white, with a narrow dark-brown band behind. Length 8, breadth 4 lines. (*Angas.*)

Stirling Range, about 40 miles inward from King George Sound.

Bulimulus (*Liparus*) *brazieri* ANGAS, P. Z. S., 1871, p. 19, pl. 1, f. 28.—BRAZIER, P. Z. S., 1872, p. 807.—PFR., Monogr. viii, p. 144.—SMITH, Proc. Malac. Soc. Lond. i, p. 95 (as a variety of *B. physoides*).—HEDLEY, t. c., p. 260.

"This pretty longitudinally rugosely plicated species belongs to the same group as *B. angasiana* Pfr., *B. baconi* Bens., and *B. mastersi* Cox, all from the southwestern region of the Australian continent" (*Brazier*).

I have not seen specimens of this form, which would seem from the figures to be much more slender than *B. physoides*, as well as more roughly sculptured. It is here subordinated to *B. physoides* in deference to the opinion of Mr. E. A. Smith.

Var. HUMILIS Pilsbry, n. v. Pl. 2, figs. 33, 34.

Shell very narrowly perforate, ovate-conic, thin; white, with some corneous-brown streaks on the last whorl, more on the spire, the apical whorls sometimes dull reddish; no dark umbilical patch. Surface somewhat shining, longitudinally wrinkled, the wrinkles stronger near the suture, weaker towards the base, more or less distinctly cut into long granules below the last suture and on the spire by decussating spirals. *Spire short*, the apex obtuse; nearly 2 nepionic whorls, deeply, finely and distinctly pitted, as in *B. kingii*. *Whorls* $4\frac{1}{2}$, the last one rather inflated.

Aperture oblique, ovate, white, or with some corneous and ochrey streaks within; outer lip simple, columellar lip reflexed rather narrowly above.

Alt. 16.5, diam. 9.4, longest axis of aperture 9.5 mill.

Alt. 17.5, diam. 10, longest axis of aperture 9.7 mill.

Western Australia (Hedley); *King George Sound* (Cox).

Allied to *B. kingii*, but the spire is much shorter, and the aperture larger. The granulation on the upper portion of the last whorl varies from distinct to ill-defined. *B. physoides*, as figured by Reeve and Smith, has a different contour, but I have not been able to compare specimens.

B. GRATWICKI (Cox). Pl. 2, figs. 31, 32; pl. 45, figs. 2, 3, 4.

Shell perforate, *oblong turreted*, rather solid, *pure white* throughout. Surface lusterless, *very strongly and irregularly wrinkled and plicate* in the direction of growth lines, the *wrinkles everywhere cut by spiral grooves into rounded grains*, which are somewhat scale-like where the wrinkles are crowded or small. Spire long, the apex obtuse; nepionic whorls 2, densely and finely wrinkled, the wrinkles irregularly waved and anastomosing. Whorls $6\frac{1}{2}$, convex, the last tapering below.

Aperture slightly oblique, small, narrowly ovate, acute above and somewhat narrowed below, white within; outer lip simple; columella broadly dilated above; parietal callus white, thick or moderate.

Alt. 24.7, diam. 10.7, longest axis of aperture 10.7 mill.

Alt. 24, diam. 10.4, longest axis of aperture 12 mill.

Western Australia: *50 miles east from Israelite Bay*, very abundant (Cox).

Bulimnus (*Liparus*) *gratwicki* Cox, Proc. Linn. Soc. N. S. Wales xxv. p. 435, figs. 1–3 (Dec. 9, 1899).

Compared with *B. brazieri* (Angas), this form differs in the greater elongation and solidity, absence of color and stronger sculpture. Whether intermediate forms occur remains to be seen; but meantime this seems to deserve recognition. The specimens were sent me for illustration by my liberal friend Dr. J. C. Cox, who has published an excellent account of the species. It was found at the locality stated above, about two miles from the edge of the cliffs, which there rise about 200 feet above the sea. Dr. Cox's type (pl. 45, figs. 2–4) measures 30 mill. in length, 10 in diameter.

B. ONSLOWI (Cox). Pl. 3, figs. 43, 44, 48.

Shell perforate, broadly ovate, rather solid, somewhat shining,

striated, surrounded by spiral decussating lines, giving the surface a rough granular appearance on the upper half; whitish, with numerous deeply-reddish longitudinal irregular bands and blotches; spire very short, broadly conical, obtuse, suture crenulated; whorls 4, rather convex, last much inflated, longer than the spire; aperture elliptically-ovate, reddish-brown, and cloudy within; peristome simple, acute, columellar margin white, expanded and reflected, covering and nearly concealing the narrow perforation. (*Cox.*)

Length 0.85, breadth 0.6 inch: [= 21.2, 15 mill.] (*Cox*, type.)

Length 0.8, breadth 0.55, length of aperture 0.55, width 0.3 inch [= 20, 13.7, 13.7, 7.5 mill.] (*Cox.*)

Western Australia: *Dirk Hartog Island* (Capt. Onslow, "Gazelle" Exped., J. J. Walker).

Bulimus onslowi Cox, Ann. and Mag. Nat. Hist. (3), xiv, 1864, p. 185; Catal. Austr. Land Shells, p. 24 (1864); Monogr. Australian Land Shells, p. 74, pl. 13, f. 13.—Pfr., Monogr. Hel. Viv. vi, p. 113.—*Buliminus* (*Liparus*) *onslowi* Cox, Martens, Monatsber. K. P. Akad. Wissensch. zu Berlin, 1877, p. 279 (1878).—*Bulimus* (*Liparus*) *onslowi* Cox, E. A. Smith, Proc. Malac. Soc. Lond. i, p. 95, pl. 7, f. 28, 29.

One and one-half apical whorls, in the small form (pl. 4, fig. 75), show a dense sculpture of crimped or zigzag wrinkles, much as in *Rhinus pubescens* Moric., the pattern being very much more minute than that of members of the *B. inflatus* group. Mr. Smith remarks of the specimens collected by Mr. Walker: "They are adult and larger than that figured by Cox, which has the appearance of being somewhat immature. The largest is 24 mill. long and 16 in diameter, aperture 14 mill. in length, 8 wide" (fig. 48).

"Five other examples are considerably smaller, averaging only 15 to 18 mill. in length. They are a trifle less globose, and more strongly granular just below the suture" (fig. 47). Apparently adult specimens (pl. 3, figs. 45, 46) of this small form before me are even smaller than the dimensions given by Mr. Smith, two measuring: Alt. 13.5, diam. 9, longest axis of aperture 8 mill., whorls $4\frac{1}{2}$; and alt. 14.5, diam. 8.2, longest axis of aperture 8 mill., whorls a trifle over 5. They are strongly granose below the suture, and striped longitudinally with pale reddish or gray and opaque white. This small form may be called *var. minor.*

Figures 43, 44 are copies of Cox's original illustration.

B. LEEUWINENSIS (E. A. Smith). Pl. 3, fig. 49.

Shell perforate, long-ovate, acuminate above, whitish, more or less streaked and spotted with brownish-corneous. Whorls 5 to 6, a little convex, separated by a rather deep suture, the upper two brownish, minutely punctate, the rest longitudinally wrinkle-striate, ornamented with several transverse series of granules, the last whorl elongated, scarcely granulated below the middle, slightly descending obliquely in front.

Aperture vertical, inversely auriform, pale brown tinted, scarcely half the entire length of the shell; peristome white, thin, simple and acute, the basal margin somewhat effuse; columellar margin distinctly reflexed, half covering the narrow umbilicus, joined to the lip by a thin callus. Length 27, diam. 12.5, length of aperture 12.5 width 6.5 mill. (Smith).

Southwestern Australia: *Cape Leeuwin.*

Bulimus (*Liparus*) *leeuwinensis* SMITH, Proc. Malac. Soc. Lond. i, p. 94, pl. 7, f. 27 (1894).

The apical whorls of this and the allied species, *B. melo, B. kingii*, and a few others, are punctate, like a fine thimble, and the extreme and rather obtuse apex is introverted, as it were, within the next whorl. The specimens vary somewhat in length, the dimensions given above being those of an average specimen. *B. melo* is a broader and more bulky species, and *B. kingii* is more acuminate above, less granular, and exhibits more coloration both externally and within the aperture. The umbilicus is more closed than in the present species, and is surrounded by a brown zone (Smith).

B. INDUTUS (Menke). Pl. 3, figs. 58, 59, 60, 61.

Shell perforate, oblong-conic, solid; color either greenish-yellow, yellowish-olive (nearly uniform or with reddish-brown streaks), or reddish-brown with some lighter streaks; the earlier whorls either white or red-brown, the interior of the umbilicus sometimes red-brown. Surface slightly shining, sculptured with slight growth-wrinkles which are stronger near the suture; the whorls of the spire granulous, by being decussated with spirals, which are wanting or very weak on the last whorl; spire conic, stout, the apex obtuse, nepionic $1\frac{3}{4}$ whorls finely and densely pitted, the pits somewhat arranged in vertical series, and in places passing into fine vertical

wrinkles. Whorls $5\frac{1}{2}$, but slightly convex, the last one oblong, tapering below.

Aperture slightly oblique, long-ovate, varying from white to livid flesh-colored within; outer lip simple, columella rather widely reflexed, white or flesh-tinted.

Alt. 36, diam. 18, longest axis of aperture 20.5 mill.

Alt. 34, diam. 18, longest axis of aperture 19.5 mill.

Alt. 37, diam. 17, longest axis of aperture 18.5 mill.

Western Australia: *Summit of the Darling Range, and at Mt. Eliza*, near the Swan River (Preiss); *Perth* (Bacon).

Bulimus indutus Menke, Moll. Nov. Holl. Spec., p. 6 (1843).—Pfr., Monogr. ii, p. 186.—Cox, Mon. Austr. Land Shells, p. 73, pl. 13, f. 10 (good).—*Bulimus* (*Liparus*) *indutus* Mke., Smith, Proc. Malac. Soc. Lond. i, p. 94.—*Bulimus rhodostoma* Gray, Reeve, Conch. Icon., pl. 49, f. 323.—*Bulimus rhodostomus* Gray, Pfr., Monogr., ii, p. 186.

? ? ? *Bulimus rhodostomus* Gray, P. Z. S. 1834, p. 65.

A well-known species, distinguished by its lengthened contour—the length usually about equal to twice the diameter—and the conspicuous olive-yellow, tawny or reddish cuticle. The aperture is quite long, its length exceeding the diameter of the shell, and acuminate above.

B rhodostomus-a of Pfeiffer and of Reeve (pl. 1, fig. 6) is probably a synonym, Reeve's figure representing an unusually short example streaked with rose-brown, and with the aperture colored, as usual in specimens with brown outside. The original *rhodostomus* of Gray is of doubtful identity. The description follows: Shell ovate, perforate, solid, striate, whitish marbled with rose, cuticle thin, olivaceous; suture delicately crenulated; whorls with two obscure, wide, posterior bands, the throat roseate; peristome a little thickened, the axis deep brown anteriorly. Axis $1\frac{1}{4}$, diam. $\frac{3}{4}$ inch. Hab. in New Holland? (Gray).

The dimensions, length 31.2, diam. 18.7, agree almost perfectly with Reeve's figure of a specimen in Cuming's collection, which however, Reeve ascribes to *rhodostoma* "with considerable doubt." Gray states that he described a specimen in his own collection, so that it is not likely that Reeve had the type. Upon the whole, it would be inadvisable to reject the name *indutus* for the earlier but doubtful *rhodostomus*.

Var. PALLIDUS Tate. Pl. 3, figs. 63, 64, 65.

Smaller than *indutus*, oblong- or ovate-conic, with only an extremely narrow umbilical chink, white (in the only specimens known to me, which have been denuded of any cuticle they may have had). Surface sculptured with slight growth-wrinkles becoming stronger and puckered at the finely crenulated suture; the spire and upper part of the last whorl decussated by spirals cutting the wrinkles into oblong granules; this decussation disappearing on the middle and lower part of the last whorl, and sometimes partly obsolete below the last suture. Whorls $5\frac{1}{4}$ to $5\frac{1}{2}$, separated by sutures a little deeper than in *indutus*. Aperture white within.

Alt. 25, diam. 14, longest axis of aperture 14.5 mill.

Alt. 23.5, diam. 14, longest axis of aperture 13.5 mill.

Alt. 28, diam. 15, longest axis of aperture 16 mill.

South Australia: "Widely diffused over the Bunda Plateau, and the dead shells are to be met with in such prodigious numbers in many places that a barrow-load could be gathered within an hour, and over the less sterile portions a foot can hardly be set down without crushing one. Westward it extends to the Roe Plains [Port Eucla], and eastward to Coymbra, and inland thence for a few miles. It does not inhabit the country east from Fowler's Bay" (*Tate*).

Bulimus indutus Menke, var. *pallidus* TATE, Trans. and Proc. and Rep. Philos. Soc. Adelaide, S. Australia, for 1878–9, p. 135 (1879).

Of this form I have received only dead specimens, from Eucla, on the border between South Australia and Western Australia, whence the form has been traced eastward around the head of the Great Australian Bight, by Professor Tate. It differs from *indutus* in being somewhat less oblong, with the aperture wider, and surface more granulated. It is widely separated geographically, *indutus* being reported only from the Darling River region, in the extreme west, while the whole range of the immediate allies of *B. inflatus* lies between that region and the Bunda Plateau.

I do not know that living specimens have been found.

B. BULLA (Menke).

Shell elliptical-ovate, perforate, rather solid, longitudinally striate; whitish under a thin greenish-yellow epidermis, painted with stripes

or bands of brown. Whorls 6, convex, submargined and crenulated ("*fimbriatis*") above at the suture. Spire moderate and obtuse. Apertnre elliptical-ovate, the throat white; columella straight, outer lip acute.

There are two varieties: (*a*) Shell with a brown band below the suture and at the base, and scattered, somewhat fasciculated, continuous brown stripes; length 10, width 6 lines (about 20, 12 mill.). (*b*) Shell with a single obsolete, interrupted, brown band below the suture, and two in the middle of the last whorl; length 7, width 5 lines (14, 10 mill.). (*Menke.*)

Western Australia: *Summit of Darling's Range* (Preiss).

Bulimus bulla MENKE, Moll. Nov. Holl. Spec., p. 7 (1843). *Cf.* COX, t. c., p. 73, and SMITH, t. c., p. 95.

This species has not been figured, and is unknown to later authors except by Menke's description. It is probably near *B. baconi.*

B. BACONI (Benson). Pl. 2, fig. 42.

Shell perforate, ovate, thin, closely striate, the upper part of the whorls granulated by spiral striæ, silky, pellucid; buff, with two chestnut bands. Spire convexly conic, the vertex obtuse, papillar. Whorls 5, a little convex, crenulated at the suture, the last one inflated, slightly longer than the spire. Aperture slightly oblique, oval, colored within like the outside, but paler; peristome simple, unexpanded, the right margin somewhat spreading above, columellar margin brown-purple, dilated and reflexed above. Length 24, diam. 14, longest axis of aperture 13½, width 8 mill. (*Pfr.*). Alt. 23, diam. 15, alt. of aperture 12, diam. 9 mill. (*Bens.*).

Western Australia: *Darling's Range, six miles from Henley Park, on the Avon River* (Dr. Bacon).

Bulimus baconi BENSON, Ann. and Mag. Nat. Hist. (2 ser.), xiii, p. 99 (Feb., 1854).—PFR., Monogr. iv, p. 479.—COX, Mon. Austr. L. Sh. p. 73, pl. 19, f. 13.—*Bulimus* (*Liparus*) *baconi* E. A. SMITH, Proc. Malac. Soc. i, p. 95, pl. 7, f. 32.

Granulate below the sutures, as in most Western Australian forms, but conspicuously banded, and with silky luster. I have not seen specimens. It may be the *B. bulla* of Menke.

B. ANGASIANUS (Pfeiffer). Pl. 3, figs. 54, 55.

Shell imperforate, ovate-conic, thin, sculptured with close longi-

tudinal folds and interrupted spiral sulci; chestnut colored, ornamented with two white bands. Spire convexly conic, the apex rather obtuse, white. Whorls 5, moderately convex, the last longer than the spire, lightly striated below the middle, rotund at base.

Aperture little oblique, angular-oval, pearly within and banded with white; peristome simple, unexpanded, the right margin somewhat curving forward, columellar margin white-calloused, arcuate, entering. Length $25\frac{1}{2}$, diam. 14, length of aperture nearly 16, width 9 mill. (*Pfr.*)

South Australia: *Port Lincoln*, on an open heath (Angas).

Bulimus angasianus Pfr., P. Z. S. 1863, p. 528; Monogr. vi, p. 106.—Cox, Mon. Austr. Land Shells, p. 70, pl. 13, f. 2.

"Among the numerous specimens collected by Mr. Masters of this species, a striking variety occurs. It is of a beautiful bright yellow color, with indications of a single reddish spiral line" (*Cox*).

B. mastersi (Cox). Pl. 3, figs. 56, 57.

Shell imperforate, ovately-conical, rather solid, rugosely-plicate, sculptured principally at the suture with interrupted spiral furrows; shining yellow or reddish-brown, adorned with longitudinal bands, formed by coalescent lines, mostly white and porcellaneous; spire small, convexly-conical, obtuse, suture impressed; whorls 4, moderately convex, the last 4 times exceeding the spire, base rounded; aperture moderately oblique, angularly oval, faintly showing within the external bands; peristome simple, straight, slender, white, columellar margin slightly thickened above. (*Cox.*)

Length 0.74, diam. 0.45 inch [= 18.5, 11.25 mill.] (*Cox.*)

South Australia: *Port Lincoln* (Masters); *Streaky Bay* (Bednall).

Bulimus mastersi Cox, P. Z. S. 1867, p. 39; Monogr. Australian Land Shells, p. 77, pl. 13, f. 14.—Pfr. Monogr. Hel. Viv. viii, p. 144 (description from Cox).—Hedley, Proc. Roy. Soc. Queensland, vi, 1889, p. 250, pl. 14, lower two figures (teeth and jaw).

"The coalescent porcellaneous bands on a darker ground, constitute the most prominent feature of this pretty species, whose nearest ally is *B. trilineatus* of Western Australia" (*Cox*).

The specimens before me (pl. 2, fig. 41) differ from Dr. Cox's type in being perforate and stouter in form. There are $4\frac{2}{3}$ whorls, the earlier somewhat irregularly, finely pitted, the rest strongly granose below the sutures, elsewhere wrinkled. The color is tawny,

streaked and lineate with opaque white. Alt. $20\frac{1}{2}$, diam. $14\frac{1}{2}$, longest axis of aperture $12\frac{1}{3}$ mill.

B. GUNNI (Sowerby). Pl. 3, figs. 50, 51, 52.

Shell *imperforate*, oblong-pyramidal, thin but somewhat solid, opaque white, almost uniform or with inconspicuous grayish (or pinkish- or bluish-gray) streaks, the early whorls flesh-colored. Surface lustreless (in the typical form), rather rudely marked with slight growth-wrinkles in places, usually with some stronger wrinkles at irregular intervals. Spire long, highly conic, the apex rather obtuse, $1\frac{2}{3}$ earlier whorls densely and very minutely but shallowly striolate, the striæ waved (pl. 4, fig. 76). Whorls 5 to $5\frac{1}{2}$, but slightly convex, the last oblong.

Aperture long-ovate, oblique, more or less deeply ochre tinted within; outer lip simple and acute, columella narrowly reflexed and adnate above.

Alt. 26, diam. 13, longest axis of aperture 13, width 7.2 mill.

Alt. 23, diam. 13, longest axis of aperture 12.5, width 7.5 mill.

Tasmania: fossil in Yellow Limestone (travertine), probably of Pliocene age, *near Hobart Town* (Strzelecki; type locality of *B. gunnii*); *Kent's group*, Bass' Straits, in travertine (W. J. Stephens). Recent on the *East coast of Tasmania*, confined to a narrow belt of coast country, and the adjacent *Maria Island* (Petterd, Hedley). Habits arboreal.

Bulinus gunnii SOWB., in Strzelecki's Physical Descript. of N. S. Wales and Van Diemen's Land, p. 298, pl. 19, f. 5 (1845).—*Bulimus gunnii* Sby., R. ETHERIDGE, Jr., Catal. Austr. Foss., p. 177. (1878).—JOHNSTON, Papers and Proc. and Rep. Roy. Soc. Tasmania for 1879, p. 90 (1880).—BRAZIER, Proc. Linn. Soc. N. S. Wales, vii, p. 121 (1882).—R. M. JOHNSTON, Geol. Tasmania, pl. 24, f. 7 (1888).—*Liparus gunni* Sby., HARRIS, Catal. Tertiary Moll. B. M., pt. 1, The Australasian Tert. Moll., p. 3 (1897).

Bulimus tasmanicus PFR., P. Z. S. 1851, p. 260; Monogr. Hel. Viv. iii, p. 406; iv, 466; vi, 107; viii, 144.—COX, Monogr. Australian Land Shells, p. 72, pl. 13, f. 1 (1868).—HEDLEY, Proc. Linn. Soc. N. S. Wales (2), vi, p. 21, pl. 2, f. 2 (jaw), 3 (teeth), 4 (genitalia) (1891).—*Buliminus* (*Caryodes*) *tasmanicus* MARTENS in Alb., Die Hel., p. 228 (1861).

Originally described as a fossil (fig. 52), from the "Yellow Lime-

stone" of Hobart Town; subsequently Pfeiffer described recent specimens as *B. tasmanicus*. The identity of the fossil form with the living was suspected by R. M. Johnston in 1880, and confirmed by John Brazier a few years later. The fossil as originally figured in Strzelecki's work corresponds in contour with the elongated whitish specimens described by Pfeiffer, and the name *tasmanicus* therefore becomes a synonym of typical *gunni*. In this form there is no spiral striation in the specimens before me, even on the spire.

Var. *brachysoma* n. v. (Pl. 3, fig. 53).

Much shorter and comparatively broader, thin, somewhat shining, sculptured with rough, irregular, whitish growth wrinkles on a greenish-yellow ground; spiral incised striæ cutting the wrinkles above. Whorls nearly $4\frac{1}{2}$, more convex. Aperture larger. Alt. 20, diam. 12.8, longest axis of aperture 13, width 8 mill.

East Coast of Tasmania (Petterd).

This may be only the short extreme in a continuous series of variations, but no intermediate examples are in the series examined. According to Cox the white typical form has a reddish-brown epidermis in the young.

Genus PLACOSTYLUS, Beck, 1837.

Placostylus Beck, Index Molluscorum, p. 57, sole species *P. bootis* Mke. (a composite of *P. fibratus* and *P. shongi*).—Martens, Die Hel., 1861, p. 185, type *B. fibratus* Martyn.

Aspastus Albers, Die Heliceen, 1850, p. 149, sole species *Bulimus miltocheilus* Rve.

Charis Albers, t. c., p. 152, for *B. malleatus* and *B. fulguratus*. Not *Charis* Hübner, 1816 (Lepidoptera) or of Newm., 1841 (Coleoptera).

Eumecostylus Albers, Die Heliceen edit. v. Martens, p. 186, 1861, type *Bulimus cleryi* Petit.

Euplacostylus Crosse, Journ. de Conchyl., 1875, p. 9, for *B. koroensis*, *kantavuensis*, *seemani*, *moussoni*, *elobatus* and *hoyti*.

Pœcilocharis Kobelt, Conchylien Cabinet, edit. 2, *Placostylus*, p. 79, for *P. hartmanni* Kob.

Leucocharis, *Placocharis* and *Callistocharis* Pilsbry, this volume.

Diplomorpha Ancey, 1884, *q. v.*

Placostylus KOBELT, Syst. Conchyl. Cab. Mart. and Chemn., edit. 2 (monograph).—HEDLEY, The Range of *Placostylus;* a study in ancient geography, Proc. Linn. Soc. N. S. Wales (3), vii, 1893, p. 335; and A Zoogeographic Scheme for the Mid-Pacific, Proc. Linn. Soc. N. S. W., 1899, p. 391 (distribution).

Melanesian *Bulimulinæ* with thimble-punctate nepionic whorls, and ovate or oblong, dextral, usually perforate shell, solid or ponderous and dark brown in the terrestrial species, thin and paler or variegated with zigzag streaks in the arboreal; often spirally malleated or corrugated. Aperture ovate or ear-shaped, frequently of a characteristic orange-red color; the outer lip blunt and unexpanded or reflexed, with a tendency to become abruptly narrower above; columella generally with a spiral fold, often calloused; parietal wall calloused and bearing a tooth, or simple.

Type *P. fibratus* Martyn.

A genus comprehending species quite diverse in appearance, often cannot be diagnosed from the shell alone, even when the general aspect is characteristic. Most *Placostyli* have a brown olive or greenish cuticle, but in some it is white, in others wanting. The particular tone of red-orange of the aperture is very characteristic when developed, but is wanting in many species. The shallow sinus of the outer lip posteriorly in the region of the lung-pore and anus, is a prevalent tendency, but imperceptible in most of the thinner species; and the apical punctation is generally worn off in the larger species, and indistinct in a few small forms.

The affinities of the group are nearest with *Bothriembryon.* The resemblance to *Partula* noticed by Dr. Kobelt and others is purely superficial, and does not indicate the relationship claimed by these authors.

The earlier monographers had but few species of this genus, the monograph by Kobelt in the Conchylien Cabinet, 1891, being the only one worthy of especial mention. The materials for a monograph were largely brought together by Crosse, who has compiled several very useful catalogues. Kobelt's work includes most of the species, which are described and figured in his usual careful manner; but it is marred by the total absence of classification, either biologic or geographic; the result being that closely allied forms are scattered at wide intervals through his pages and plates.

The distribution of *Placostylus* has been the subject of an able

memoir by Charles Hedley, who advances the theory that "the various islands inhabited by *Placostylus* would seem to have been joined, if not into one continuous and contemporaneous whole, yet into larger fragments, which temporarily united, allowing the passage of snails from one tract to another." He bases this conclusion upon "the essential unity of the *Placostylus* area as a zoological province, embracing the archipelagoes of Solomon, Fiji, New Hebrides, Loyalty, New Caledonia, Lord Howe and New Zealand; a unity explicable only on the theory that they form portions of a shattered continent, and are connected by shallow banks formerly dry land. This continental area I propose to call the Melanesian plateau."

In the dismemberment by subsidence of this land mass, it is likely that the New Zealand, Lord Howe and New Caledonian area were first divided from the rest, then the Fiji and New Hebrides areas were segregated, leaving the Solomon group united to Papuan land for a longer period.

The Placostylus of New Zealand, Lord Howe and New Caledonia are closely allied. Those of the other island groups are about equally isolated one from the other, so far as this genus is concerned. Probably all the species of the Solomons are more closely related *inter se* than any of them to those of other island groups, and the same applies to the Fijian and possibly to the New Hebrides groups, excepting some species of these islands which seem closely allied to New Caledonian forms. For this reason, I have arranged the species geographically in the following pages, following this sequence and classification:

Archipelagoes.	*Sections.*
New Zealand and Lord Howe I.	PLACOSTYLUS Beck, type *fibratus*.
New Caledonia. .	PLACOSTYLUS s. str. LEUCOCHARIS Pils., type *pancheri*.
New Hebrides. .	PLACOSTYLUS. PŒCILOCHARIS Kob., type *hartmani*. DIPLOMORPHA Anc., type *layardi*.
New Guinea. . .	*P remotus* Hedley.
Solomon Islands.	PLACOCHARIS Pils., type *macgillivrayi*. ASPASTUS Alb., type *miltocheilus*. EUMECOSTYLUS Alb., type *cleryi*.
Viti or Fiji Islands.	EUPLACOSTYLUS Crosse, type *seemanni*. CALLISTOCHARIS Pils., type *malleatus*.

Species of New Zealand and Lord Howe Island.

These forms are closely allied to those of New Caledonia, and belong strictly to the typical section of the genus.

P. SHONGII (Lesson). Pl. 11, figs. 5, 6, 7, 8.

Shell imperforate or rimate, oblong-conic, quite solid and strong; varying from yellow with numerous narrow chestnut streaks, fading at their edges, and crossed by fainter spiral lines and narrow bands, to chestnut with some darker streaks; paler or denuded on the earlier whorls, and with a whitish subsutural border, denuded of cuticle. Surface smoothish, with low longitudinal wrinkles, stronger below the suture. Spire elongate, the apex slightly obtuse. Whorls 7 (or in small shells, $6\frac{1}{2}$), moderately convex, the latter part of the last somewhat swollen below and obliquely produced.

Aperture less than half the length of the shell, vertical, scarlet within, fading to yellow in the throat; peristome whitish, the outer lip expanded, thickened and angular on its face, thickened within, and typically bearing a tubercle near the upper insertion, separated by a short interval from a low or strong flange, which may be either smooth or denticulate, and which terminates in a strong tubercular tooth close to the base of the columella; the teeth and flange often subobsolete. Columella scarlet, sloping, concave, sometimes indistinctly folded above, far within; parietal callus strong, scarlet, with whitish outer edge.

Alt. 84, diam. 38, length of aperture 41 mill.

Alt. 75, diam. 34, length of aperture 36 mill.

Alt. 67, diam. 29, length of aperture 32 mill.

New Zealand: *Northern part of the North Island, at North Cape, Cape Maria Van Diemen, Bay of Islands, and Wangoroa.*

Bulimus shongii Lesson, Voy. autour du Monde la Corvette S. M. "La Coquille," Zool., ii, p. 321 (1830), pl. 7, f. 4, 5 (1826).—Kuster, Conchyl. Cab., p. 55, pl. 16, f. 14, 15.—Pfr., Monogr. ii, p. 140; iii, 378; iv, 447.—Reeve, Conch. Icon. pl. 24, f. 159.—Gould, U. S. Expl. Exped., Moll., p. 79, f. 85 (1852).—Alb.-Mart., Die Hel., p. 185.—*Placostylus shongii* H. & A. Adams, Gen. Rec. Moll. ii, p. 153.—Frauenfeld, Verh. Zool.-bot. Ges. Wien, 1869, p. 874.—*Bulimus fibratus* Gray, in Dieffenbach's New Zealand, ii, p. 247 (excl. syn.).—*Bulimus bovinus* Brug., Petit, Journ.

de Conchyl. 1853, p. 404.—Crosse, J. de C., 1864, p. 124 (with var. *candida*).—Pfeiffer, Monogr. vi, p. 82; viii, p. 118.—Hector, Catal. Land Moll. of N. Z. p. xx (1873).—*Placostylus bovinus* Brug., Martens, Critical List of Moll. of N. Z., p. 13 (1873); Monatsber. K.-P. Akad. Wiss. Berlin, p. 279.—Hutton, Man. of N. Z. Moll., p. 14 (1880); Trans. N. Z. Inst. xiii, p. 200 (teeth); xiv, p. 152, pl. 4, f. K, pl. 3, f. D (radula), pl. 3, f. O (jaw), 1882; Tr. N. Z. Inst. xvi, p. 190 (1884).—Hedley & Suter, Proc. Linn. Soc. N. S. Wales (2), vii, p. 632 (1892).—Suter, Journ. de Conchyl. xli, 1893, p. 236.—Kobelt, Conchyl. Cab., *Placostylus*, p. 36, pl. 9, f. 1.—*Bulimus auris-bovina* Petit, Journ. de Conchyl. 1853, pp. 403–405.—Crosse, Revue Zool. 1855, p. 82.

Allied to *P. bivaricosus* of Lord Howe's Island, and *P. fibratus* of New Caledonia. The former differs in the distinctly truncate base of the columella, lack of a light subsutural border, flatter lip, etc.; *P. fibratus* has a strong columellar fold and a differently formed lip and columellar margin.

The type of *P. shongii* was taken by Gabert "at the cascade of Kiddi-Kiddi, under the trees bordering the river of the same name," in the neighborhood of the Bay of Islands. It was named after a celebrated chief of that region. Figure 6 represents a typical specimen, the upper and basal tubercles being well developed, and the lateral callus smooth. In some other shells, apparently quite mature, the teeth are obsolete and the callus very low (fig. 7); while others have the callus very strong and beset with low tubercles (fig. 5). In immature shells the lip is of course thin and merely expanded, and the rich color of the mouth is wanting. Two varieties are admitted by Professor Hutton and Mr. Suter, but their status is rather uncertain.

M. Petit de la Saussaye, in 1853, rejected the name *shongii*, previously in use for this species, in favor of that of *bovinus* or *auris-bovina* of Bruguière; and he was followed by Crosse, Pfeiffer, and all modern students. By the terms of Bruguière's description, as well as by the figures he cites (to which, however, I attach no great weight), it is impossible that he could have had the present shell before him. He states that in *B. bovinus* the length of the aperture is half that of the shell; the columella has a single quite projecting fold, placed obliquely, etc., all of which applies to *P. fibratus* but not to *P. shongii*. Bruguière refers to an illustration in Lister (pl. 1058,

f. 8), and a copy of it in Favanne (pl. 65, f. v), which does not represent a *Placostylus*, but probably an *Amphidromus*, and to figures in Chemnitz's Conchylien Cabinet which represent a form of *Placostylus fibratus*.

Melania aurantia Perry (Conchology, pl. 29, fig. 1, 1811), has been referred to this species as a synonym, largely because Perry gives the locality "New Zealand." The figure represents a short species with strong columellar fold, and is totally incompatible with *B. shongi*. I cannot identify it with anything—not a rare dilemma in dealing with Perry's preternaturally bad figures.

Professor Hutton has figured the jaw and teeth of this species. He was also the first to unite *B. novoseelandiæ* Pfr. as a variety or synonym. There are several errors in the bibliographic references given by Suter and Kobelt.

Bulimus antipodarum Gray (Dieffenbach's *New Zealand*, ii, p. 247, 1843) was formerly thought to be a young specimen of *P. shongi*, but recent investigations by Mr. Suter have shown it to be a young *Helicostyla*, probably *H. fulgetrum*. Gray's type has been figured by Mr. E. A. Smith in the Zoology of the Voyage of H. M. S. Erebus & Terror, Mollusca, p. 3, pl. 1, fig. 5, under the name "*Bulimus antipodum*." It was said to have been procured at Kaitaia, N. Z., by Dr. Dieffenbach.

Var. NOVOSEELANDICUS (Pfr.).

Shell imperforate, ovate-oblong, solid, irregularly rugose-striate; tawny-brown, here and there streaked with chestnut; spire ovate-conic, flesh-colored above, the apex rather acute, suture uneven, widely white-margined. Whorls 6, moderately convex, the last as long as the spire, somewhat attenuated basally, columella vertical, scarcely twisted.

Aperture subvertical, rhombic-semioval, *buff-whitish inside;* peristome thickened, *white*, the margins joined by a whitish callus, the right margin a little expanded, slightly arcuate above, very feebly sinuated within; basal lip forming an angle with the dilated, adnate columellar margin. Length 77, diam. 31, aperture 35 mill. long inside, 15 wide. (*Pfr.*)

Whangarun, Bay of Islands (Hochstetter); *Whangarei* (Suter).

Bulimus novoseelandicus PFR., Malak. Bl. viii, p. 149 (1861); Monogr. Hel. Viv. vi, p. 83.—CROSSE, Journ. de Conchyl, 1864, p.

128.—Hector, Catal. Landmoll. N. Z., 1873, p. 20.—Hutton, Man. N. Z. Moll. p. 14 (1880).—*Placostylus bovinus* var. *neozelanicus* Pfr., Hutton, Trans. N. Z. Inst. xvi, p. 190.—*P. bovinus* var. *novoseelandica* Suter, Journ. de Conchyl. 1893, p. 237.

Probably a mere phase of variation rather than a true sub-species. I am unable to see that the following form differs in any respect save absolute dimensions, which vary widely in all species of this group.

Var. *candidus* (Crosse). Columella subvertical, peristome white; aperture buff-whitish within, the basal margin with a single tubercle, right lip slightly sinuated within, above. Length 86, diam. 36 mill. (*Crosse.*)

Resembles the typical form in size and contour, but differs in that the columella is a little more vertical, and more especially, the peristome is completely white. The interior of the mouth is very light yellowish white.

P. bivaricosus (Gaskoin). Pl. 12, figs. 1, 2, 3, 4.

Shell imperforate, oblong-conic, rather solid; cuticle tawny chestnut colored with dark chestnut streaks, paler or lost on the buff or flesh tinted earlier whorls. Surface scarcely shining, with moderate growth-wrinkles, stronger near the suture, and sometimes faint, low, coarse spiral sulci; the spire occasionally decussate. Spire rather long, the apex obtuse. Whorls $5\frac{1}{2}$ to 6, the nepionic $2\frac{1}{2}$ whorls sculptured with fine, close, waved and somewhat branching and anastomosing vertical wrinkles, becoming finer and more crowded on the latter portion; distinctly demarked from the subsequent growth when unworn. Last whorl oblong, tapering above and below. Sutures parallel, or the last one more oblique. Aperture ovate, slightly oblique, red-orange within the outer lip, ochraceous in the throat; peristome reddish with a dull white outer edge, thickened and slightly reflexed, flattened on the face, the outer lip with a blunt, thick flange within, interrupted near the upper termination, and lower toward the base. Columella and parietal callus cherry-red, the former oblique, more or less folded above, abruptly truncated basally.

Alt. 61, diam. 27, longest axis of aperture + peristome 31 mill.

Alt. 51, diam. 25, longest axis of aperture + peristome $27\frac{1}{2}$ mill.

Lord Howe Island, in sheltered places under stones, abundant.

Bulimus bivaricosus Gaskoin, P. Z. S. 1854, p. 152, pl. 29, f. 4,

5.—Pfr., Monogr. iv, p. 447; vi, 83.—Gassies, Faune N. Caléd., p. 47, pl. 3, f. 2.—Crosse, Journ. de Conchyl. 1864, p. 128; 1894, p. 171.—Etheridge, Austr. Mus. Mem. no. 2, Lord Howe Island, p. 27.—*Placostylus bivaricosus* Gask., Hedley, Records of the Australian Museum, i, no. 7, p. 140, pl. 21, f. 4 (jaw), pl. 22, f. 3 (teeth) (1891).—Kobelt, Conchyl. Cab., p. 53, pl. 13, f. 4, 5.

The typical form of this species is smaller than *P. shongi* of New Zealand, with less convex whorls and abruptly truncated columella. It also lacks the white subsutural border of *P. shongi* and *P. fibratus*, which seem to be its nearest allies.

"This species speaks eloquently of a recent land connection extending on the one side to New Caledonia and on the other to New Zealand. It is confined to Lord Howe Island." (*Hedley.*)

The variability of the species is great, as the works of Hedley and Etheridge show; there being three recent forms and one fossil found within the confines of an island less than seven miles long and about a mile wide.

Var. cuniculinsulæ (Cox). Pl. 11, fig. 5, pl. 10, fig. 1.

Shell broadly rimate, small, thin and light, olivaceous yellowish with brown streaks. Whorls $5\frac{1}{2}$, aperture ovate, the outer lip a trifle expanded, with slight, reddish, internal thickening; columella concave, not calloused or truncate below, and with the parietal wall, cherry-red. Alt. 42, diam. 20 mill.

Rabbit, or Goat Island, in the lagoon of Lord Howe Island.

Bulimus cuniculinsulæ Cox, P. Z. S. 1872, p. 19, pl. 4, f. 3.—Pfr. Monogr. viii, p. 118.—*B. bivaricosus* var. *cuniculoides* Cox, Brazier in Etheridge, Austr. Mus. Mem. no. 2, p. 30.—*Placostylus bivaricosus* var. *cuniculinsulæ* Cox, Hedley, Rec. Australian Mus. i, no. 7, p. 141.—*Placostylus cuniculinsulæ* Cox, Kobelt, Conchyl. Cab., p. 71, pl. 17, f. 2, 3.

Var. etheridgei (Brazier). Pl. 12, figs. 9, 10.

A large, thin, elongate form, exhibiting transverse malleated furrows. On the last whorl the epidermis is nearly black, the bright cherry-red of the typical aperture has almost disappeared, only the columellar plication retaining a trace; the nacreous lining of the interior and the callus on the body-whorl are tinged a greenish-blue. Length 65, breadth 27, length of aperture 30, breadth 20 mill. (*Hedley.*)

Under the wall of Mount Ledgbird, Lord Howe Island.

Bulimus (*Eurytus*) *etheridgei* BRAZIER, Australian Mus. Mem., no. 2, 1889, explanation to pl. 5 (name only), pl. 5, f. 1, 2, 7, 8 (figures reversed).—*Placostylus bivaricosus* var. *Etheridgei* Braz., HEDLEY, t. c., p. 141.

A thin, obliquely ovate form.

Var. SOLIDUS (Etheridge). Pl. 12, figs. 6, 7, 8.

Shell larger than the species proper, thick, and to some extent rugged from the roughness of the oblique semi-imbricating sculpture which irregularly crenulates the edges of the sutures. Spire relatively longer, and to some extent more acute; sutures at times somewhat channeled; last whorl more inflated. Peristome enormously thickened; the callosity extending between the outer and the pillar lips across the body of the whorl in a very marked manner, exposing many concentric laminæ of growth; the outer edge of such thickening often projecting like a varix; inner edges of the lips sinuous and sometimes deeply emarginate, or channeled at the anterior and posterior ends of the peristome, the latter more or less sharply angled; callosity of the pillar lip rising into tubercles, usually well pronounced, opposite the anterior emargination and posterior angle of the aperture, the posterior tubercle being the largest. (*Etheridge.*)

Coral rock and overlying calcareous sand dunes, Lord Howe Island.

B. bivaricosus var. *solida* ETHERIDGE, Austr. Mus. Mem. no. 2, p. 27 (1889).—*Placostylus bivaricosus* var. *solidus* ETH., Rec. Austr. Mus. i, no. 7, p. 131, pl. 20, f. 1–6.

Fig. 2 of pl. 12 is a recent specimen approaching the var. *solidus*, the typical form of which occurs only fossil, though in a very recent, probably pleistocene deposit.

Mr. Etheridge further observes as follows: The above characters are, to a very much less extent, visible in some one or other of a large assemblage of the species proper, but in the var. *solidus*, all are of a very pronounced nature, so much so that had these shells been met with in an older fossiliferous formation, they would at once have been erected into a separate species. No doubt there is a tendency to occasionally thicken the shell in some living examples, in fact, one such is before me; but the extent to which this extra secretion of lime proceeds is not often met with in recent specimens of *P. bivaricosus*. The most marked differences, however, between the latter and var. *solidus* lie in the peristome, where the outer and inner

lips broaden, exposing repeated laminæ of growth, the callosity on the body whorl thickens greatly, supporting strong tubercles and emarginations, whilst a roughening of the surface occurs on the outer lip, almost amounting to an immature denticulation, and the posterior angle of the peristome becomes much more acute, and is deeply channeled. Great variability is also noticed in the state of the umbilicus, this aperture in some cases becoming completely closed and overlapped by the spreading laminæ of the pillar lip.

Species of New Caledonia and the Loyalty Is.

The terrestrial species attain their acme in this area, some of them being the thickest and heaviest of all land shells. The very close relationship existing between the forms of New Caledonia proper and those of the Loyalty Islands probably indicates that the whole archipelago was united in comparatively recent times into one much larger land mass, upon which the heavy typical group of *Placostylus* and the thin whitish *Leucocharis* were developed from the common ancestral stock. The peculiar nepionic characters of the arboreal *Leucocharis* show that it is not allied to Solomon or Fijian groups, as Crosse held, but is an independent branch.

The terrestrial species live in the woods, generally in cool, moist places. They only crawl around after rains. Pairing occurs in April, and elliptical eggs which in *P. porphyrostomus* measure 4 by 5 mill., and are pure white, are laid in a shallow pit, in a moist spot, and covered with dead leaves.

They hold an important place in the native cuisine, *P. souvillei* being the chief species eaten in the south, *P. porphyrostomus* around Noumea. Properly prepared they recommend themselves to the European palate, but are rather leathery and not easy of digestion, according to M. Marie—the young ones being softer, and not unlike *Helix pomatia*.

The species are polymorphic to a degree, and their identification is often excessively difficult and uncertain. There cannot be much doubt that too many species have been described from specimens which represent merely individual or racial variations; but it would seem that forms of all stages of differentiation occur in bewildering abundance, and in the apparent absence of conditions adverse to the perpetuation of intermediate forms, there is more than the usual difficulty in the limitation of conventional species.

There has been a large amount of work done on the New Caledonian forms, chiefly by French authors. The critical examination of that fauna began in 1845, when the missionary, R. P. MONTROUZIER, who had been driven from Woodlark Island, one of the Louisiades, by the natives, took up his residence in New Caledonia. Then followed a notable series of discoveries extending over twenty-two years; the researches of this devoted and enlightened apostle bringing to scientific knowledge one of the most remarkable island faunas of the world. Part of his discoveries were published by Montrouzier himself, part by Souverbie, Gassies, Fischer and Crosse.

Another missionary, Lambert, shared in the work during the later part of Montrouzier's life, and it was he who discovered the remarkable quaternary deposits of land shells on the islet Koutoumo. Among the more recent collecting naturalists, G. Dupuy, Saves, Bavay and E. Marie have done excellent work, and their names have been attached to species of *Placostylus* discovered by them. Layard, British Consul for many years at Noumea, also added to our knowledge of the fauna by extensive collections.

The most extensive special work on the New Caledonian fauna is J. B. Gassies' *Faune Conchyliologique terrestre et fluvio-lacustre de la Nouvelle-Calédonie*, in three volumes, issued in 1863, 1871 and 1880; originally published in the *Actes de la Societé Linnéenne de Bordeaux*, on the same dates. Nearly all the other work on the fauna appeared in the *Journal de Conchyliologie*; and it was therefore peculiarly fitting that the latest and most complete treatment of the fauna, Crosse's *Fauna malacologique terrestre et fluviatile de la Nouvelle-Calédonie et ses dépendances*, should appear in the same periodical for 1894. The following account is based chiefly upon that of this most competent malacologist, amplified, of course, by reference to all other literature, and controlled by the series of shells in the collection of the Academy.

SYNOPSIS OF GROUPS.

1. Arboreal species; shell thin, slender and white; lip expanded, thin, without apertural teeth or callosities (*Leucocharis*).

a. Ovate-fusiform, closely wrinkled spirally. *pancheri*.

a[1]. Fusiform, more slender; spiral sculpture inconspicuous. *loyaltyensis*.

2. Terrestrial species; shell solid, covered with a dark cuticle or denuded (typical *Placostylus*).

a. Shell not very thick, the aperture openly ovate, outer lip hardly or not calloused, the columella without a strongly projecting fold, not calloused. *Group of P. bavayi*, p. 30

*a*¹. Shell usually large, solid and often compressed; lip and columella generally heavily calloused, but the aperture open and usually large. *Group of P. fibratus*, p. 35

*a*². Shell moderate sized, of compact, ovate contour; the lip, columella or both bearing heavy callosities, more or less contracting the rather small aperture. *Group of P. porphyrostomus*, p.

Group of P. bavayi.

These forms are the least specialized of the New Caledonian species, retaining the generalized features of the species of the New Hebrides (*P. fuligineus*, etc.) and the Solomons (*P. founaki*).

P. EDDYSTONENSIS (Pfeiffer). Pl. 6, figs. 1, 2, 3.

Shell imperforate, ovate-conic, rather thin, closely striate and subobliquely malleated, deep chestnut; spire exactly conic, the apex acute, suture lightly impressed, somewhat crenate. Whorls 6, a little convex, the last a little longer than the spire, rounded at base. Columella thin, receding, subplicate, orange. Aperture a little oblique, subangulate-oval, pearly and greenish-livid within; peristome simple, slightly expanded, obtuse, dull orange-colored; columellar margin slightly dilated. Alt. 74, diam. 34, length of aperture 42 mill. (*Pfr.*).

Hienguen (Montrouzier, Magen, Marie); *Ouagap* (Rossiter); *environs of Balade* (Magen), *and of Pouebo* (Magen).

Bulimus Eddystonensis PFEIFFER, Proc. Zool. Soc. London, p. 88 (1855); Malak. Blätter, ii, p. 157, 1855 (*Eurytus*); Novit. Conch., i, p. 54, pl. 16. f. 1, 2 (1856); Monogr. iv, p. 363; vi, 8.—GASSIES, J. de C., vi, p. 274, 1857; Faune Nouv. Caléd. i. p. 49, 1863; ii, p. 88, pl. 7, f. 3.—CROSSE, J. de C., xii, p. 146, 1864.—*Bulimus hienguenensis* CROSSE, J. de C., vol. xix, p. 181, 1871; xviii, p. 218, pl. 8, f. 3, 1875.—*Bulimus servaini* EUTHYME, in Bull. Soc. Malac. France, ii, p. 244, 1885.—*Placostylus hienguenensis* KOBELT, Conch. Cab. *Placostylus*, p. 113, pl. 27, f. 5, 6, 1891.—CROSSE, J. de C., 1894, p. 288.

"The shell and peristome are comparatively thin in this species; the peristome, usually orange, tends sometimes to become reddish." Pfeiffer originally described a specimen in the Cuming collection,

supposed to be from Eddystone Island in the Solomon group; but subsequent researches locate the species in New Caledonia. To obviate the error as to locality implied in Pfeiffer's specific name, Crosse re-named the species *B. hienguenensis;* and Frère Euthyme, thinking the New Caledonian shell different from the supposed Solomon Island species, called it *B. servaini.*

P. BAVAYI (Crosse & Marie). Pl. 7, figs. 13, 14.

Shell nearly covered perforate, ovate-conic, somewhat inflated, rather thick, solid, very delicately striated and closely rugate-malleate. Dirty whitish rose under a chestnut epidermis, which is largely deciduous in adults. Spire conic, the apex sub-acute, suture somewhat crenulated. Whorls 6, convex, somewhat inflated, the last not descending, longer than the spire, ventricose, receding toward the right, obliquely rotund at base. Columella subplicate, receding.

Aperture very oblique, broadly subangulate-oval, glossy and pale orange-livid inside; peristome simple, thickened, of a rather bright orange color, the terminations joined by a thick and prominent parietal callus which bears a strong, median, deeply placed tooth. Columellar margin expanded, dilated, partly covering the perforation; basal and outer margins somewhat thickened. Length 74, diam. 43, length of aperture with peristome 41½ mill. (*Crosse*).

Summit of Mt. Mou, New Caledonia (Marie).

Bulimus bavayi C. & M., CROSSE, J. de C. 1868, p. 161, pl. 8, f. 1.—PFR., Monogr. viii, p. 121.—GASSIES, Faune ii, p. 89, pl. 8, f. 1.—MARIE, J. de C. 1870, p. 383.—*Placostylus bavayi* KOBELT, t. c., p. 42, pl. 10, f. 1.—CROSSE, J. de C. 1894, p. 290.

"It is one of the thickest of the thin-lipped group of New Caledonian *Placostylus.* The last whorl has a tendency to be inclined to the right; the aperture is quite markedly oblique." It is a rare and local species.

Var. *dupuyi* Kobelt. Pl. 7, figs. 15, 16.

Shell rimate-perforate, acutely ovate, comparatively thin but solid, dark brown, the cuticle becoming yellowish-chestnut on the penult. whorl, those earlier being nude and roseate. Surface with slight, irregular growth-wrinkles, and conspicuously malleated throughout. Spire small, conic, slightly attenuated above; whorls 5½ or 6, the last very large. Aperture somewhat oblique, ovate, bluish inside; peristome simple, but slightly thickened, pale orange; columella concave, dilated; parietal callus thin, whitish and toothless.

Alt. 68, diam. 42, length of aperture 43 mill.

Alt. 68, diam. 43, length of aperture 45 mill.

Summit of Mt. Mou, New Caledonia, 1219 meters elevation.

Bulimus bavayi, un individu jeune, CROSSE, J. de C. 1868, p. 162, pl. 8, f. 1a.—*Placostylus dupuyi* KOBELT, Conchyl. Cab. p. 43, pl. 10, f. 2, 3, 4.—CROSSE, J. de C. 1894, p. 291.

It is somewhat less solid than *P. bavayi*, wants the parietal tooth and the spire differs somewhat in shape.

P. BONDEENSIS (Crosse & Souverbie). Pl. 8, figs. 20, 21.

Shell imperforate, ovate-conic, solid, subcompressed, longitudinally rugate-striate; pale flesh-whitish covered with a deep chestnut epidermis streaked with brown-black. Spire conic, the apex subacute; suture impressed, slightly striate-crenulate, generally denuded of cuticle and whitish. Whorls 7, a little convex, the first 4 wanting cuticle, fleshy-whitish, the penultimate obliquely and obsoletely malleate-striate; last whorl slightly ascending in front, a little longer than the spire, more or less conspicuously spirally substriate, slightly inflated in the middle, a little attenuated basally.

Aperture nearly vertical, ovate piriform, livid yellowish-blue within, the throat sometimes peculiarly granose; peristome obtuse, hardly reflexed, thickened, whitish-buff, the margins joined by a thick parietal callus, which usually bears a moderate sized median tubercle, rather deep within. Columellar margin slightly vertical, outer lip slightly sinuate above. Length 75, diam. 40, length of apert. inside 33 mill. (*C. & S.*).

Bonde, in the interior of New Caledonia (Lambert, Marie).

Bulimus bondeensis C. & S., J. de C. 1869, p. 270, pl. 8, f. 1.—GASSIES, Faune, ii, p. 84, pl. 7, f. 3.—PFR., Monogr. viii, p. 118.—*Placostylus bondeensis* KOBELT, t. c., p. 111, pl. 27, f. 3, 4.—*B. b.* var. *edentula* C. & S., l. c., pl. 8, f. 1a, 1b.—*Placostylus bondeensis* and var. *edentula* CROSSE, J. de C. 1894, p. 290.

"This species is readily distinguished from its congeners by the livid blue tint of the interior of the aperture, and the yellowish-whitish peristome." It is thicker than *P. bavayi* and the other forms here associated, and possibly belongs rather to the *P. fibratus* group.

Var. *edentula* C. & S. (pl. 8, fig. 22) lacks the parietal tubercle, the peristome is white and the interior slate blue. The cuticle is also darker, blackish-brown. It is from the same locality.

P. CURTUS, (Crosse). Pl. 7, fig. 17; pl. 8, figs. 23, 24.

Shell imperforate, oval or oval-conic, comparatively not thick but solid, irregularly and coarsely striate longitudinally, and transversely malleate, especially on the last whorl. Rose-yellowish under a persistent epidermis of a more or less intense brown color. Spire convexly conic, the summit rosy yellow, denuded, smooth and glossy. Suture impressed. Whorls $6\frac{1}{2}$, a little convex, the last moderately swollen and exceeding three-fifths the total length of the shell, a little ascending in front.

Aperture subvertical, a little receding toward the base, acutely oval, glossy and orange-purple inside; peristome of the same color, but becoming yellowish outwardly; margins united by a thin callus colored like the peristome; columellar margin a little dilated near its insertion, with an almost imperceptible fold. (*Crosse* for *P. layardi*).

Length 76, diam. 39, aperture 43 mill. (*Crosse*).

Length 76, diam. 44, aperture 43 mill. (*Kobelt*).

Mont Tiebaghi, near Coumac, in northwestern New Caledonia (Rossiter).

Placostylus layardi KOBELT, Conchyl. Cab. p. 110, pl. 27, f. 1, 2. —CROSSE, J. de C., 1894, p. 292, pl. 9, f. 1, with var. *curta*, p. 293, pl. 9, f. 2.

Though thinner than most New Caledonian species of *Placostylus*, this species is thicker, more solid and broader than *P. eddystonensis*. It differs from *P. bavayi* in the fine color of the aperture and less inflated last whorl.

Typical *curtus* Crosse (pl. 7, fig. 17) is smaller than the specimens originally described as *layardi*, (pl. 8, f. 23, 24), somewhat inflated, scarcely submalleate, fleshy-whitish under a pale chestnut cuticle; aperture ovate, orange-purple, paler inside. Alt. 69, diam. 37, apert. 40 mill. It is from Coumac.

The name *layardi* is preoccupied in the subgenus *Diplomorpha*, and Crosse's varietal name must be substituted.

P. SAVESI Crosse. Pl. 6, figs. 4, 5.

Shell nearly covered-rimate or imperforate, oblong, moderately thick, rather solid, malleate-wrinkled; pale fleshy-whitish under a thin, deciduous, chestnut epidermis. Spire rather long, the apex slightly obtuse, nearly smooth, glossy, whitish; suture irregularly impressed. Whorls $6\frac{1}{2}$, a trifle convex, the earlier 4 destitute of epi-

dermis, the last whorl longer than the spire, somewhat inflated in the middle, tapering at base.

Aperture ovate-angulate, red within, paler in the throat; peristome somewhat thickened, vivid red, margined with whitish, the margins connected by a livid whitish parietal callus. Columellar margin dilated, expanded, subreflexed, nearly straight; basal margin narrowly rounded; outer margin a little thickened, the thickening not extending to the posterior insertion. Length 56, diam. 28, apert. 30 mill. (Crosse.)

Pouembon (Marie); fossil at *Artillery Point*, *Noumea* (Savés).

Placostylus savesi Crosse, J. de C., 1886, p. 163, pl. 7, f. 3, 3a; 1894, p. 294.

Differs from *P. eddystonensis* by the shorter, more compact form and the coloration; from *P. bavayi* by the less dilated last whorl and narrower aperture, with no trace of a parietal tubercle. It may perhaps be allied more closely to *P. ouveanus* and other small members of the *fibratus* group.

P. rossiteri (Brazier). Pl. 24, figs. 12, 13.

Shell imperforate, oblong, moderately solid; chestnut with many darker streaks, the suture white-bordered. Surface smoothish, with irregular growth-wrinkles, the penultimate whorl generally malleated transversely. Spire convexly conic. Whorls 6, several earlier ones denuded, fleshy-yellow tinted, the last whorl oval, not inflated, tapering below.

Aperture subvertical, ovate, brilliant scarlet or yellow within; peristome distinctly thickened with a deep scarlet callus within, the edge obtuse, flesh-colored and dull outwardly; columella deep scarlet, with a moderate fold above; parietal callus moderately thick, of the same color, toothless.

Alt. 58, diam. 28, aperture with peristome 31 mill.

Alt. 52, diam. 26, aperture with peristome 29 mill.

Nehone Bay, northwestern coast of New Caledonia (Rossiter).

Bulimus rossiteri Brazier, Proc. Linn. Soc. N. S. W., vi, June, 1881, p. 586.—*Bulimus* (*Placostylus*) *rossiteri* Brazier, Crosse, J. de C., 1881, p. 338, pl. 12, f. 6.—*Placostylus rossiteri* Braz., Kobelt, t. c., p. 39, pl. 9, f. 4, 5.—Crosse, J. de C., 1894, p. 294.

Distinguished by its oblong, not inflated form, dark-streaked cuticle, and the intense red of the aperture. The last whorl is not at all, or but little, malleated. Type in coll. A. N. S. Phila.

Group of P. fibratus.

This is the most prolific New Caledonian group in species and varieties. The latter are apparently endless; and as no distinction has yet been made between individual variations and racial divergence, the subject is in almost inextricable confusion. Milton's line "All hope abandon ye who enter here" serves as well for those entering upon the study of these Placostyles as in its original application. Only very extensive local series collected by an observant and careful naturalist can illuminate this subject.

P. ALEXANDER (Crosse). Pl. 13, figs. 1, 2; pl. 14, figs, 6, 7, 8.

Shell imperforate, ovate-conic, thick, *strongly compressed* from front to back, the two sides subangular; white under a reddish-chestnut cuticle; smoothish or irregularly wrinkled-striate. Whorls 6, the last large, much wider, flattened. Aperture large, whitish-yellow within, the peristome pale orange-yellow; outer lip reflexed, strongly thickened, slightly sinuated within, above; columella thickened, bearing two low callosities. Length 85, diam. 50 mill.

Length 103, diam. 65, length of aperture 69 mill. (largest seen).

Length 78, diam. 51, length of aperture 52 mill. (smallest seen).

New Caledonia: *Ina, near Ougap (Wagap);* also at Kanala (?)

Bulimus alexander CROSSE, Revue Zoologique, (2), vii, pp. 34, 83, pl. 4, f. 2, 3 (1855); Journ. de Conchyl. 1864, p. 108—GASSIES, Faune Conch. N. Caléd. i, p. 42, pl. 3, f. 1 (1863).—PFR. Monogr. iv, p. 369; vi, p. 13; viii, p. 18 (varieties).

Placostylus alexander KOBELT, Conch. Cab. *Placostylus*, p. 27, pl. 7, f. 1, pl. 8, f. 1 (1891).

Var. PROCERULA: *Bulimus alexander, var. a.* CROSSE, Revue Zool., p. 34, 83, pl. 4, f. 1 (1855). GASSIES, Faune, i, p. 43, 1863. —*Bulimus alexander, var. b.* CROSSE, Journ. de Conchyl., xii, p. 109 (1864).—GASSIES, Faune ii, p. 74 (1871.)—*B. a.* var. *procerula* PFR., Monogr. viii, 18.—*Placostylus alexander* var. *procerula* KOBELT Conch. Cab., *Placostylus*, p. 29.

Var. OUAGAPENSIS; *Bulimus alexander*, var. *g*, CROSSE, Journ. de Conchyl., xvii, p. 179 (1869).—var. *ouagapensis* PFR., Monogr. viii, 18.—*Placostylus alexander* var. *ouagapensis* Kobelt, Conch. Cab. *Placostylus*, p. 29.

Var. CRASSA: *B. alexander* var. *d* CROSSE, Journ. de Conchyl. xviii, p. 243, 414 (1870). GASSIES, Faune Conch. Nouv. Caléd.,

ii, p. 74 (1871).—Marie, J. de C. xviii, p. 382 (1870).—var. *crassa* Pfr., Monogr. viii, 18.

Var. leucostoma: *B. alexander*, var. e, Crosse J. de C., xxii, p. 108, 182 (1874); xxiii, p. 139, pl. 6, f. 4, (1875). *Placostylus alexander*, var. *leucostoma*, Kobelt, Conch. Cab., *Placostylus*, p. 29, (1891).

Var. nigricans: *Bulimus souvillei* var. B *nigricans*, Crosse, J. de C. ii, p. 111, (1864).

Var. *procerula* Crosse, 1864 (pl. 14, fig. 8). More lengthened, the aperture paler; callosities of the inner lip almost wanting; lip reflexed but less thickened. Length 90, diam. 55 mill.

Var. *ouagapensis* Crosse, 1869. A little smaller and shorter, hardly shining, whitish-roseate under a pale chestnut cuticle, which is very deciduous especially on the earlier whorls. Aperture vivid orange inside, becoming buff-whitish in the throat; peristome pale orange, the margins strongly thickened, the basal one somewhat projecting, showing an obtuse tubercle. Length 78, diam. 48, aperture with peristome 49 mill. long, 30 wide (*Crosse*). *Wagap.*

Var. *crassa* Crosse, 1870 (pl. 14, fig. 7). Larger, wider; dirty white under a blackish chestnut cuticle which is obscurely marked with minute, almost inconspicuous, transverse narrow bands. Last whorl much longer than the spire (as 66 to 34), ascending, broadly ventricose, the sides compressed, angular. Aperture orange; peristome buff-orange, thickened, the margins joined by a thick callus bearing an obtuse tubercle; columellar margin broadly expanded, lightly twist-folded. Length 119, diam. 66, aperture with peristome 65 mill. long. 42 wide (*Crosse*). *Wagap* (*Ouagap*).

Var. *leucostoma* Crosse. (Pl. 14, fig. 6). A little smaller than the typical form; whorls 6, the first 4 whitish, nude, the penultimate and last covered with a chestnut cuticle, obscurely and slightly flexuously transversely lineolate. Aperture milk-white inside; peristome milk-white, at the edge ivory-yellowish. Length 75, diam. 47 mill.; aperture with peristome 54 mill. long, 34 wide (*Crosse*).

Var. *nigricans* Crosse. Blackish, with somewhat undulating narrow bands. A form of large size and with nearly black epidermis, formerly referred to *P. souvillei*. It has the lateral angulation of *P. alexander*, however.

The typical form of *P. alexander* is short, with whitish aperture,

and light yellow peristome. It is a variable species, and the number of varieties could easily be extended, but without advantage to science, so far as I can see.

The prominent feature of the species is its extreme compression, shown in fig. 2 of pl. 13. The last whorl ascends a little anteriorly; the columellar fold proper is not large, but there is a callus of greater or less extent superposed upon it. The parietal tooth varies a good deal in degree of development, fig. 1 representing one extreme, fig. 8 the other. I suspect the latter is not adult.

P. CORPULENTUS (Gassies). Pl. 9, fig. 27.

Shell imperforate, large, somewhat ponderous, rather thick, globose, a little compressed, ovate pyramidal, longitudinally rugose-striate, chalky (being fossil and destitute of epidermis); suture impressed, the apex acute. Whorls 6–7, convex, the last two-thirds the total length, slightly compressed.

Aperture long-ovate, contracted, auriculate, angular above, where the outer lip is strongly sinuous, reflexed at the base. Columella thick, a trifle concave, folded, the fold of moderate size, ascending and entering. Parietal wall with a thick callus bearing a conic tooth. Peristome thick, reflexed, the right margin deeply sinuate above, prominently calloused in the middle. Alt. 100, greater diam. 55, lesser 50 mill.; length of aperture 52 mill. (*Gass.*)

Fossil; *Isle of Pines and islet of Koutoumo,* in company with *P. senilis* but scarcer (type locality Lambert); superficial strata at *Artillery Point, near Noumea* (Layard).

Bulimus corpulentus GASSIES, Faune N. Caléd. ii, p. 183 (1871). —*Placostylus corpulentus* KOBELT, t. c., p. 121, pl. 30, f. 1.

The figure is copied from Kobelt, whose specimen came from Artillery Point, near Noumea. It is more inflated than *P. senilis* or *P. goroensis*, less so than *P. alexander.*

P. ABBREVIATUS (Gassies). Pl. 20, fig. 45.

Imperforate, ponderous, thick, globose-rotund, conic-pyramidal, longitudinally striate. Whorls 6½, the last globose. Aperture auriculate, contracted, round-ovate, angular above, the outer lip strongly sinuated; columella thick, slightly concave, with a moderate sized ascending fold; parietal callus thick, bearing a large conic tooth. Length 68, diam. 37 mill.

Fossil; Lifu, Loyalty Is. (Lambert).

B. abbreviatus Gassies, Faune ii, appendix, p. 192 (1871); Journ. de Conchyl. 1878, p. 334; Faune iii, p. 41, pl. 4, f. 1.—*Plac. abbreviatus* Kobelt, t. c., p. 122, pl. 30, f. 2 (copied from Gassies).

Apparently a well-marked species. I have not seen specimens.

P. kanalensis (Crosse). Pl. 23, figs. 1, 2, 3.

Shell imperforate, ovate-pyramidal, quite solid. "The spire is long and somewhat subulate; the last whorl is subcompressed, perceptibly angular at the sides, as in *P. alexander*, and it is widest nearer the base than in most of its allies; the earlier whorls are whitish and denuded, the following ones covered with a chestnut epidermis. The peristome is ivory white or orange tinted yellow; aperture a more or less purplish orange shade. Columellar fold and parietal tooth only moderately developed." Whorls $6\frac{1}{2}$ to 7, but slightly convex.

Alt. 81, diam. 40, length of aperture with perist., 46 mill. (*Crosse.*)

Alt. 100, diam. 58, length of aperture with perist., 60 mill. (fig. 1).

Environs of Kanala, New Caledonia (Marie).

Bulimus souvillei var. *kanalensis* Crosse, Journ. de Conchyl., 1869, p. 69.—*Placostylus kanalensis* Cr., Kobelt, Conchyl. Cab., *Placostylus*, p. 99, pl. 24, f. 1–3 (1891).—Crosse, J. de C., 1894, p. 264, pl. 10, f. 1.—*Bulimus cicatricosus* Gassies, Faune Conch. N. C., ii, p. 72 (exclusive of figure), 1871.—*Placostylus kanalensis* var. *tchioensis* Kob., t. c., p. 100, pl. 24, f. 4, 5.—*P. k.* var. *thioensis* Crosse, J. de C., 1894, 264.—*P.* (*kanalensis* var.?) *subeffusus* Kob., t. c., p. 101, pl. 24, f. 6.

The slender, almost acuminate spire is characteristic. The lip is thicker than in *P. souvillei*. Fig. 2 is a copy of Crosse's figure of his type.

Var. *tchioensis* Kobelt (Pl. 22, figs. 1, 2). Shell imperforate, long-ovate, compressed, rather solid, not very thick, rudely striate or scarred malleate; whitish, covered with a greenish-chestnut epidermis. Spire convexly conic, denuded, buff, the apex slightly obtuse. Whorls $6\frac{1}{2}$, convex, separated by an impressed rather irregularly margined suture, regularly increasing, the last scarcely inflated, elongated, compressed, nearly double the length of the spire, scarcely ascending in front. Aperture vertical, long-ovate, acuminate above,

purplish-orange within, with brownish streaks; peristome orange-whitish, obtuse, slightly thickened, the terminations joined by a thin, brownish, nearly toothless callus; outer margin produced in the middle, basal margin effuse, columellar margin arcuately ascending, slightly dilated, with a very obsolete fold. Length 69, diam. 36, aperture 40 mill. (*Kobelt.*)

Tchio (probably *Thio* or *Tio*), on the east coast of New Caledonia.

Probably not quite fully adult, as Crosse holds.

Var. *subeffusus* Kobelt (pl. 23, fig. 4). Shell ex-umbilicate, ovate-acuminate, not very thick, subtranslucent, compressed, rudely striated and malleate, obsoletely spirally lirate and even striate; whitish, covered with a greenish-chestnut epidermis, indistinctly spirally fasciolate. Spire conic, worn, the upper whorls buff, apex slightly obtuse. Whorls 6½, slightly convex, separated by a somewhat ragged, white-spotted suture, regularly increasing; the last whorl more convex, slightly inflated, compressed, angular along the left margin, exceeding three-fifths the total length, more rapidly descending near the aperture. Aperture vertical with receding base, broadly oval, deeply excised by the penult whorl above, orange-brownish inside, pale-edged; peristome brownish-orange, obtuse, slightly thickened, lightly expanded, very distinctly effuse at the base, the terminations joined by a thin callus, somewhat thickened in the middle; outer lip not sinuated above, columellar nearly straight in the middle, and nearly parallel to the slightly arcuate, scarcely dilated columellar margin, which is not folded. Alt. 65, diam. 36, aperture 38 mill. (*Kobelt.*)

Tchio, east coast of New Caledonia.

A form of doubtful relations, known by a single specimen, and chiefly distinguished by the foldless columella, thin texture, and effuse basal lip.

P. FIBRATUS (Martyn). Pl. 15, figs. 15, 16; pl. 16, figs. 21, 22, 24.

Typical *P. fibratus* is a rather uncommon form with a strong parietal nodule, the contour rather slender. Martyn's type figure is copied, pl. 15, fig. 15; the other figures referred to above illustrating more or less similar specimens.

Southern New Caledonia and Isle of Pines.

Limax fibratus MARTYN, The Universal Conchologist, pl. 25 (1789); reproduced by Chenu, Biblio. Conch. ii p. 21, pl. 7, f. 3.—

Bulimus fibratus Mart., Pfr., Monogr. ii, 139; iii, 377; iv, 446; vi, 82; viii, 115.—Gassies, Journ. de Conchyl., vi, p. 273, 1857; Faune Conch. Nouv-Caléd., p. 39, pl. 4, f. 1, 1863; vol. ii, p. 57, 1871.—Crosse, J. de C. xii, p. 112, 1864.—E. Marie, J. de C. xviii, p. 385, 1870.—*Placostylus fibratus* Kobelt, Conch. Cab., (ed. 2). *Placostylus*, p. 47, pl. 11, fig. 2–6, 1891.—Crosse Journ de Conchyl. 1894, p. 251.—*Bulimus danieli* Crosse, in Rev. Zool., p. 84, pl. 4, f. 4, 5, 1855—*Bulimus ouensis* Gassies, Journ. de Conchyl. xviii, p. 142, 1870; Faune Conch, N.-C., ii, p. 68, pl. 3, f. 5—Pfr. Monogr. viii, p. 20.—*P. ouensis* Kobelt, t. c., p. 118, pl. 29, f. 3, 4, 1891.—Crosse, t. c., p. 260. *Bulimus falcicula* Gassies, Faune Conch. Nouv.-Caléd., ii, p. 190, 1871.—*Bulimus albo-roseus* Gassies, Faune ii, p. 189, 1871.—*Bulimus bulbulus* Gassies, Faune ii, p. 193, 1871; and in Journ. de Conchyl. xxvi, p. 337, 1878; Faune Conch. Caléd., iii, p. 47, 1880,(young shell).—*Bulimus carbonarius* Gassies, Journ, de Conchyl., xxvi, p. 337, 1878; Faune Conch. Caléd., iii, p. 47, 1880.—*Bulimus neconensis* Gassies, Journ. de Conchyl., xxvi, p. 337, 1878; Faune Conch. N.-Caléd., iii, p. 47, 1880.—*Bulimus infundibulum* Gassies, Journ. de Conchyl., xxvi, p. 337, 1878; Faune Conch. N. Caléd., iii, p. 47, 1880, (monstrosity).

Bulimus superfasciatus Gassies, Journ. de Conchyl., xxvi, p. 337, 1878; Faune Conch. Nouv. Caléd., iii, p. 47. 1880.—*Bulimus patens* Gassies, Journ. de Conchyl., xxvi. p. 337, 1878.—*Bulimus fibratus* var. *sinistrorsa* Crosse, Journ. de Conch., xxix, p. 340, pl. 9, f. 2, 1881; 1894, p. 254. *Bulimus fibratus* var. *b.* Crosse, Journ. Conchyl., xii, p. 113, 1864.

Bulimus pinicola Gassies, Journ. de Conchyl., xviii, p. 142, 1870; Faune Conch. Nouv. Caléd., ii, p. 59, pl. 4, f. 1, 1871.—Pfr., Monogr. viii, p. 20.—*Bulimus insignior* Euthyme, Bull. Soc. Malac. France, ii, p. 242, 1885—*Placostylus fibratus* var. *pinicola* Kobelt, Conch. Cab., *Placostylus*, p. 89, pl. 21, f. 3, 1891.—Crosse, Journ. de Conchyl., 1894, p. 255.

Voluta auris malchi b. Gmelin, Syst Nat. p. 3437.—*Bulimus borinus* Brug. Encycl. Meth. i, p. 345 (1792).—Küster, Conchyl. Cab. p. 18, pl. 4, f. 5, 6.—*Placostylus fibratus* var. *pallidula* Crosse J. C., 1894, p. 253 (based upon *Auris Midæ*, Chemnitz, Conch. Cab., vol. xi. part 2, p. 42, pl. 121, f. 1039–1040 (1786).—*Voluta australis* Dillwyn, Descript. Catal. i. p. 500 (1817).—*Auricula borina* Lamarck, An. s. Vert. vi, p. 139; edit. Desh., viii, p. 328.

—*Helix auris bovinus* Fer., Prodr. p. 57 ; Histoire, pl. 159, f. 1–5 (exclusive of "monstrum"). — *Pupa auris bovina* Gray, Ann. of Philos., n. ser., ix, p. 413. — *Auricula aurantiaca* Schumacher, Essai d'un Nouv. Syst., p. 228 (1817). — *Bulimus bootis* Menke, Syn. Method., edit. 2, p. 26 (1830). — *Placostylus bootis* Beck, Index Moll., p. 57 (in part).

Placostylus (*fibratus* var. ?) *knoblauchi* Kobelt, Conch. Cab., (ed. 2), *Placostylus*, p. 15, pl. 3, fig. 1, 1891.—*P. fibratus* v. *knoblauchi* Crosse, l. c.

Bulimus imbricatus Gassies, Faune Conch. Nouv.-Caléd., ii, p. 187, 1871 ; Journ. de Conchyl., vol. xxi, p. 50, pl. 2, f. 5, 1873.—*Bulimus fibratus* var., Gassies, Faune Conch. Nouv. Caléd., iii, p. 47, 1880.—Pfr., Monogr., viii, p. 26.—*Placostylus imbricatus* var., Kobelt, Conch. Cab., *Placostylus*, p. 129, pl. 32, f. 1, 1891.—Crosse, t. c., p. 254.

Bulimus bairdii Reeve, Conch. Icon., *Bulimus*, f. 272, 1848.—*P. fibratus* var. *bairdi*, Crosse, t. c., p. 253.—*Placostylus fibratus* var. *peculiaris* Kobelt, Conch. Cab., *Placostylus*, p. 86, pl. 20, f. 4–5, 1891.

Placostylus fibratus var. *crassa*, Layard MS., in Kobelt, Conch. Cab., *Placostylus*, p. 85, pl. 20, f. 3, 1891.—*Placostylus fibratus* var. *ventricosa* Kobelt, t. c., p. 88, pl. 21, f. 1, 1891.—*Placostylus fibratus* var. *ovalis* Kobelt, t. c., p. 88, pl. 21, f. 2, 1891.—*Bulimus auris-midæ* Reeve, Conch. Icon., *Bulimus*, f. 170, 1848.—*Placostylus fibratus* var. *ovata* Crosse, t. c., p. 253, 1894.

Bulimus lalannei Gassies, Faune Conch. Nouv.-Caléd., ii, p. 185, 1871.—*P. lalannei* Crosse, t. c., p. 259.

Bulimus insignis Petit, Journ. de Conchyl., i, p. 57, pl. 3, fig. 1, 1850. — Gassies, Faune Conch. Nouv. Caléd., i, p. 40, 1863.—*Placostylus insignis* Kobelt, Conch. Cab., p. 46, pl. 11, fig. 1, 1891. —*P. fibratus* var. *insignis* Crosse, t. c., p. 253.

Bulimus fibratus var. *mareana*, Crosse, Journ. de Conchyl., xviii, p. 242, 413. 1870 ; Gassies, Faune Conch. Nouv.-Caléd., ii, p. 58. 1871.—*P. f.* var. *gareana* Pfr.-Cless., Nomencl. Hel. Viv. p. 215.—*Placostylus ouveanus* var. *turrita* Kobelt, t. c., p. 89, pl. 21, f. 4, 5. 1891.

Bulimus fibratus var. *grammica*, Crosse, Journ. de Conchyl., xviii., p. 242, 412, 1870.—*Bulimus souvillei* var. *grammica* Gassies, Faune Conch. Nouv.-Caléd., ii, p. 71, 1871.

Bulimus edwardsianus GASSIES, Faune Conch. Nouv.-Caléd., i, p. 40, pl. 4, f. 2, 1863.

Var. *pinicola* Gassies. (Pl. 17, fig. 26.) Distinguished from typical *fibratus* by the smooth epidermis, without wrinkle striæ, and having some white dots below, and the very deep blood red color of the interior. Type measures: length 90, diam. 44, aperture 45 mill. Seems a very weakly characterized form. Perhaps the shell figured on plate 15, fig. 17 belongs to this race. *Isle of Pines.*

Crosse has figured a sinistral monster, apparently belonging to this variety. See pl. 17, fig. 27.

Var. *bovinus* Brug. (Pl. 20, fig. 41). Elongate, pale olivaceous with brownish streaks; lip whitish with a pale orange submargin, the throat light ochreous; columellar fold small, the parietal tubercle scarcely noticeable. This variety includes var. *pallidula* Crosse.

Var. BAIRDI Reeve. (Pl. 19, figs. 35, 38). *Much elongated,* turreted, solid, the cuticle varying from yellow with brown streaks to chocolate-brown. *Aperture small,* yellow or orange-red within, the peristome heavily calloused, white; parietal tubercle high and conic; columellar fold strong; lip usually with a thickening and shallow sinus above. Length 76, diam. 33 mill.

Pl. 15, fig. 18 and pl. 16, fig. 25 are also forms referable to or near *bairdi*, though not typical.

Var. *peculiaris* Kobelt. (Pl. 17, figs. 28, 29). Much elongated fusiform, solid and thick, irregularly transversely wrinkled, the wrinkles oblique, confluent. Whorls $8\frac{1}{2}$, the last ascending to the aperture, which is small, much contracted and buff-white; peristome extremely thick, the outer lip deeply sinuated above, then thickened; columella with a very thick fold-like tubercle, the heavy parietal callus bearing a strong, acute tubercle. Alt. 78, diam. 32, length of aperture 38 mill. *Isle of Pines.*

Described from one dead shell, incrusted with calcareous material.

Var. LEUCOLENUS (Crosse). Pl. 45, fig. 6.

Shell very narrowly and covered perforate, oblong-conic, rugose-striated; whitish under a chestnut epidermis, which is longitudinally radiated with darker; suture impressed. Whorls 7, a little convex, the earlier 3 wholly destitute of cuticle, whitish, the last whorl a little shorter than the spire (in the ratio of 32 : 38). Aperture oblong-oval, milk-white within; peristome thickened, sub-reflexed,

milk-white, the ends joined by a moderately thick white callus, bearing a median tubercle; collumellar margin a trifle folded, dilated, almost completely closing the umbilical chink; basal and outer margins thickened and somewhat reflexed.

Length 70, diam. 36 mill.; aperture with peristome, 33 mill. long, 25 wide (*Crosse*). *Isle of Pines* (Lambert).

Placostylus leucolenus Crosse, Journ. de Conchyl., xliii, 1895, p. 80, pl. 5, f. 6.

This form bears some resemblance to *P. fibratus* and its variety *cicatricosus*, but with the following differential characters: the shell substance under the cuticle is entirely white, as are the peristome and interior; the columellar fold is but slightly developed, and there is a minute umbilical chink. As it was described from a single shell, which, moreover, had suffered an injury in the third whorl, somewhat altering the form of those following, I do not think the specific rank given by M. Crosse likely to be sustained.

Var. *danieli* Crosse. (Pl. 15, figs. 13, 14.) Cuticle olivaceous-chestnut, persistent; lip thickened, slightly sinuous above and below; parietal nodule slight, the columellar fold rather strong; last whorl peculiarly contracted backward and to the right. Aperture vivid red within, the peristome ivory-like. Length 80, diam. 33 mill.

Var. *knoblauchi* Kobelt. (Pl. 18, fig. 34). A very large form, rudely rugose-striate, malleated and indistinctly lirate spirally; fleshy-reddish under a thin brown epidermis which is indistinctly banded above; suture white-edged, strongly ascending toward its termination. Aperture vinous-brown inside; columella with a strong twisted fold, separated from the parietal wall by a distinct sulcus; peristome fleshy-orange, thick; the orange parietal callus bearing a conic tooth. Length 124, diam. 56, aperture 68 mill.

Var. *insignis* Petit. (Pl. 25, figs. 17, 18). A very small form, length 65 mill., with 6–7 whorls, the columella with a strong fold, parietal wall bearing a nodule; apex more or less deep colored inside; lip moderately thick.

Var. *ouensis* Gassies (Pl. 45, fig. 7). An elongate form with pale aperture, measuring 86 mill. long, diam. 41, aperture 44 mill. Its prominent features are said to be the acute spire and dilated base, the expansion of the peristome, and the yellow striate and malleated epidermis, with triangular white spots. It is said by Gassies to be from the Islet of Uen, south of New Caledonia. Layard procured it at the Isle of Pines.

Var. IMBRICATUS Gassies, 1871. (pl. 21, fig. 47). Shell perforate, obese-ovate, ventricose with conic spire; *surface coarsely and deeply plicatulate longitudinally, the wrinkles cut by fine, deeply engraved spiral lines.* Earlier whorls yellowish, the last covered with a rather thin yellow cuticle streaked with brown, a subsutural band white. Aperture wide, red-orange within, paler in the throat, the lip whitish, thickened, sinuous above; columella wide, with a fold above, a small projection at its junction with the basal lip. Parietal callus bearing a moderate tubercle. Length 78–80, diam. 40, length of aperture 42 mill.; or smaller, length 69, diam. 40 mill.

Boulari Bay (Lambert).

The specimen before me is more strongly decussated than the type figure shows.

Var. LALANNEI Gassies. Imperforate or rimate, fusiform, acuminate, solid, longitudinally and transversely streaked, obliquely malleated, reticulate; white under a buff-brown, olivaceous epidermis, ornamented with obliquely longitudinal brown stripes and blackish transverse narrow lines; apex buff, punctate, shining; spire conic, ovate-elongate, suture impressed, denticulate, with a buff or white hair-margin. Whorls 7–8, a little convex, the last two-thirds the total alt.; aperture ear-shaped, long, angular above, rounded below, narrow in adults; columella very thick, strongly reflexed over the umbilicus, rather flattened, with a long ascending and entering fleshy-rose-colored fold; parietal fold conic, subhorizontal, reddish; peristome thickened, reflexed, whitish rose, the outer lip sinuous above, expanded at the base; the margins joined by a moderate rose-white callus; interior orange-scarlet, pearly. Length 87 to 100, diam. 45, length of aperture 54, width 18 mill. (Gassies).

Boulari, quite abundant.

A var. *minor*, length 80, diam. 33, apert. 37 mill., has the peristome white.

Gassies seems to think that this may be one of the varieties of *B. fibratus*, and he points out no distinguishing characters.

Var. GRAMMICUS Crosse. Large, elongate, pale chestnut, obscurely painted with brown, sub-undulating, close, transverse, narrow bands; suture whitish. Whorls $7\frac{1}{3}$, the first $4\frac{1}{2}$ roseate, destitute of cuticle, the last whorl slightly ascending, as long as the spire. Aperture pale orange, becoming buff-whitish in the throat; peristome pale orange-ivory tinted, the margins joined by a thick callus bear-

ing a strong whitish tubercle; columellar margin strongly folded; outer margin slightly sinuated above. Length 111, diam. 47, aperture with peristome 56 mill. long, 33 wide. (*Gassies.*)

Yaté, Conception, Bay de Sud, Mont Coqui (Marie), *Goro* (Lambert). Widespread in the south, but not at Balade or Kanala.

This form attains a length of 150 mill. at Goro. It is referred to *P. souvillei* by Gassies.

Var. CRASSUS "Layard" Kobelt (Pl. 18, fig. 30). Imperforate, ovate, solid, thick, rudely and subregularly costate-striate, indistinctly spirally rugose or malleated, covered with a greenish-brown epidermis; spire shortly conic, the apex acute. Whorls 7, convex, separated by an impressed, crenulated and white-bordered suture, the last whorl large, compressed, ascending in front. Aperture large, ovate, vivid purplish-orange within, the peristome paler or pale orange, very glossy; peristome thickened, a little reflexed, margins joined by a thick glossy callus, which is toothless or with a very slight tooth, the outer margin produced in the middle, columellar margin dilated, appressed, armed with a paler tuberculiform fold. Alt. 88, diam. 48, length of aperture with peristome 54 mill. (*Kobelt.*) *Isle of Pines.*

Var. *ventricosus* Kobelt (pl. 17, fig. 25). Near var. *crassus*, but the shell is thinner, wider, last whorl more compressed, nearly angulated along the left side, the parietal callus bearing a tubercle. Alt. 90, diam. maj. 50, min. 36 mill. *Isle of Pines.*

Var. *ovalis* Kobelt (pl. 18, fig. 33). Differs from the type in the ovate, thinner shell with short spire, the last whorl exceeding two-thirds the total length of the shell, compressed below. Aperture large, nearly entire; throat blood-orange colored, the peristome paler. Alt. 85, diam. 43, aperture 54 mill. (*Kob.*). *Isle of Pines.*

Var. *ovata* Crosse (pl. 16, fig. 20). Rather large and ventricose, with open aperture and small columellar fold and parietal nodule. Scarcely to be distinguished from the preceding variety, which is prior.

Var. EDWARDSIANUS Gassies, (pl. 19, figs. 39, 40). Umbilicated, small, length about 60–65 mill., white under a decidedly *deciduous black streaked chestnut cuticle*, compact, the spire rather short and conic. Aperture small, contracted, red within, *peristome* ivory-white, *very much thickened, built forward, having a deep sinus above*, the columella with a moderate fold; parietal tooth whitish, deep-seated. *Nēkētē, Kanala, and Pot Island.*

Var. *strigatus* n. v. (pl. 15, fig. 19, and pl. 19, fig. 36, 37). This form is similar to v. *edwardsianus* in size and contour, and in the more or less deciduous chestnut and black streaked cuticle. It is usually umbilicated or perforate, often spirally malleated. The aperture is similar to that of *edwardsiana* but with far less developed peristome.

Var. *mareanus* Crosse, 1870, (pl. 18, figs. 31, 32). Small, thick, rosy-whitish under a chestnut-brown, partly deciduous cuticle. Whorls 7, the earlier $3\frac{1}{2}$ roseate, the last whorl slightly ascending, about as long as the spire. Aperture beautiful violet-purple inside, parietal callus thick, bearing a tubercle; columellar margin strongly twisted-plicate, outer margin strongly sinuated above. Length 66, diam. 28, length of aperture wtth peristome 33 mill. (*Crosse*).

Mare and Ouvea, Loyalty Is. The figures represent *P. ouveanus* var. *turrita* Kob., which Crosse holds to be identical.

P. ARENOSUS (Gassies). Pl. 20, fig. 44.

Imperforate, thick, malleated; whorls 6, the apex rather obtuse; aperture contracted, auriculate, the peristome thick, slightly reflexed; columella thick, plicate; a descending dentiform parietal fold above. Length 75, greater diam. 55, lesser diam. 30, aperture 28 mill. long, 10 wide.

Fossil; Lifu, Loyalty Is. (Lambert).

Bulimus arenosus GASSIES, J. de C., 1878, p. 333; Faune iii, p. 40, pl. 3, f. 1.—*Plac. arenosus* KOBELT, Conchyl. Cab., p. 123, pl. 30, f. 3. (Copied from Gassies.)

Allied to some forms of *P. fibratus*, and perhaps referable to that species as a variety.

P. FALCICULA (Gassies). Unfigured.

A fossil form from South Bay (Baie du Sud), New Caledonia. Destitute of cuticle and color, long-oval, ovate, noticeably perforate, strongly striate longitudinally, cut by transverse striæ and "imbricated," the suture margined and ruffled. Whorls 7, slightly convex, the last $\frac{2}{3}$ the total length. Aperture ovate, very angular above and rounded at the base, ends of the peristome connected by a thick callus bearing a median, conic tooth. Columella subvertical, without external twist. Outer lip strongly notched above, sickle-shaped, the lower termination of the notch forming an almost acute angle. Peristome very convex, light yellow with nacreous reflections; interior

retaining some trace of orange color. Length 80, diam. maj. 40, aperture 44 mill. long, 15 wide.

Fossil at South Bay (Lambert).

Bulimus falcicula GASSIES, Faune ii, p. 190 (1871).

Apparently distinct by the sickle-shaped upper termination of the outer lip. It has not been figured, the above account being compiled from Gassies.

P. OUVEANUS ('Dotzauer,' Mousson). Pl. 9, figs. 25, 26.

Shell covered perforate, long-ovate, irregularly and strongly wrinkle-striate, decussately impressed with some elongate wrinkles; deep brown or streaked with paler. Spire regular, the apex rather obtuse, denuded; suture irregularly crenate and with a plicate-striate margin below, white. Whorls 6, the earliest elegantly punctulate, the following somewhat convex, last whorl larger, a little ascending, ovate, compressed around the umbilical perforation. Aperture vertical, as long as the spire, ovate-auriform, pale orange or livid whitish-brown; peristome buff-whitish, somewhat expanded, thickened, lipped within; the margins remote, joined by a one-toothed callus, the upper margin slightly protracted at the insertion, lightly sinuated, arcuate in the middle; columellar margin with a tuberculose long oblique callus within, the outer edge broadly reflexed, covering the perforation. Alt. 51, diam. 26½ mill. (*Mouss.*)

Ouvea, Loyalty Is. (Dotzauer).

Bulimus ouveanus DOTZAUER, in MOUSSON, Journ. de Conchyl., xvii, p. 60, pl. 4, f. 4, 4*a*, 1869.—PFR., Monogr. viii, p. 116.—GASSIES, Faune Conch. Nouv.-Caléd., ii, p. 62, 1871.—*Placostylus ouveanus* KOBELT, Conch. Cab. (edit. 2), *Placostylus*, p. 11, pl. 1, f. 4, 5, 1891.—CROSSE, J. de C., 1894, p. 260.—*Bulimus ouveanus*, var. *β*, *lifouana*, CROSSE, Journ. de Conchyl., xvii, p. 180, 1869.—GASSIES, Faune Conch. Nouv.-Caléd., ii, p. 63, 1871.—*Placostylus ouveanus* var. *lifouana* KOBELT, Conch. Cab., p. 12, 1891.—*Bulimus ouveanus* var. *γ*, *alba*, CROSSE, Journ. de Conchyl., xxii, p. 109, 184, 1874; xxiii, p. 218, pl. 8, f. 4, 1875.—*B. ouveanus* var. *albida* CROSSE, J. de C., 1884, p. 330.—*Placostylus ouveanus* var., KOBELT, t. c., p. 12.—*Bulimus ouveanus*, *monstr. sinistrorsa* CROSSE, Journ. de Conchyl., xxxii, p. 328, pl. 7, f. 3, 3*a*, 1884.—*Bulimus ouveanus*, *monstr. scalaris* CROSSE, t. c., p. 329, pl. 7, f. 4. 4*a*.—*Bulimus æsopeus* GASSIES, Faune Conch. Nouv.-Caléd., ii, p. 87, 1871; Jour.

de Conchyl., xxi, p. 51, pl. 2, f. 6, 1873; Cf. Faune Conch. Nouv.-Caléd., iii, p. 47, 1880 (as monstr. of *B. ouveanus*).—Pfr., Monogr., viii, p. 121.—*Placostylus æsopeus* Kobelt, t. c., p. 82, pl. 19, f. 7 (??), 8, 1891.—*P. ouveanus* var. *æsopea* Crosse, t. c., p. 261.

P. ouveanus is smaller, thinner and rougher than *P. fibratus*, but Crosse is probably right in considering it a form of that species dwarfed by the lack of lime, and produced with substantially the same appearance, independently, in several distinct localities. Some specimens are orange within the aperture.

Var. *lifouanus* Crosse. Smaller, hardly thickened, dirty white, not shining, under a brown, almost wholly deciduous cuticle. Length 46½, diam. 26 mill. (*Crosse*).

Lifu, Loyalty Is. (Marie).

Var. *albus* Crosse (pl. 27, fig. 25). White, destitute of epidermis, the aperture and peristome uniform milk-white; columellar fold tooth-like; parietal fold small, scarcely noticeable. Length 48, diam. 23½, aperture 24 mill.

Siandé, New Caledonia (Marie).

Form *sinistrorsus* Crosse. A sinistral form from Lifu.

Monst. *scalaris* Crosse. Turreted, with abnormally deep sutures, long spire and rounded whorls. From Lifu.

Monstr. *æsopeus* Gassies (pl. 20, fig. 43) is an abnormally depressed form, described from the Isle of Pines. It is probably not correctly referred to *ouveanus*, but belongs rather to *fibratus*. It is a "subfossil" shell, not yet found living, and apparently a mere individual monster.

P. souvillei (Morelet). Pl. 22, fig. 4.

Shell imperforate, very large and capacious, ovate, solid; dark yellowish-chestnut, *with numerous darker reddish-chestnut belts and lines.* Surface sculptured with moderate growth-wrinkles, but without spiral sculpture; sometimes somewhat malleated in places. Spire conic, the apex slightly obtuse. Whorls 6½, but slightly convex, the last large and oval, hardly compressed between the front and back.

Aperture vertical, ample, deep red-orange within the lip, fading in the throat to pale ochre or blue-white; peristome obtuse but not much thickened, the outer lip whitish, a little sinuous; columella bearing a large callous fold above; parietal wall with a rather low blunt tooth, and with the columella, of a red orange color.

Length 120, diam. 65, length of aperture 76 mill. Sometimes as long as 150 mill.

Southern part of New Caledonia, especially at *South Bay and Yate* (Marie); *Goro* (Lambert).

Bulimus souvillei MORELET, Bull. Soc. Hist. Nat. Moselle, April 2, 1857; separate copies of the same, "Test. Nov. Austr.," p. 1.—GASSIES, Journ. de Conchyl., vi, p. 273, 1857; Faune Conch. Nouv.-Caléd., i, p. 41, pl. 7, f. 1, 1863; ii, p. 70, 1871; with var. *eximius*. —FISCHER, Journ. de Conchyl., vi, p. 300, pl. 4, f. 13, 1857.—PFR., Monogr. vi, p. 81; viii, p. 114 (exclusive of varieties in footnote).—CROSSE, Journ. de Conchyl., xii, p. 110, 1864.—*Placostylus souvillei* Kobelt, in Conch. Cab. (edit. 2), *Placostylus*, p. 8, pl. 1, f. 1; pl. 2, f. 1, 1891.—CROSSE, J. de C., 1894, p. 62.—*Bulimus eximius* ALBERS, Malak. Bl., iv, p. 96, May 20, 1857 (not of Reeve).—PFR., Monogr. iv, p. 446; Novit. Conch., i, p. 118, pl. 33, f. 1, 2.

A large, dark, capacious and distinctly banded species, with the lip but little thickened, not calloused within nor noticeably sinuated above. The spire is always more or less denuded.

P. LAMBERTI (Gassies). Pl. 22, fig. 3.

Shell large, imperforate, ovate-oblong, solid, longitudinally strigate and circularly malleated; covered with a brownish-buff, glossy, evanescent epidermis; suture impressed, crispate, white. Spire fusiform, the apex obtuse, pale corneous, shining. Whorls 7, convex, the last two-thirds the total length.

Aperture vertical, oval, dark buff-orange within, glossy; parietal fold small, tubercular; columellar fold thick, ascending, flesh-colored and glossy, blood-red above; peristome thickened, scarcely reflexed, buff-white, the margins joined by a brownish callus, bearing a tubercle in the middle; slightly angulate above, a little expanded below. Length 100, diam. 50, aperture 48 mill. long inside (*Gassies*).

Uvea, Loyalty Is. (Lambert).

Bulimus lamberti GASS., Journ. de Conchyl. xvii, p. 72 (1869); Faune, ii, p. 69, pl. 3, f. 6 (1871).—PFR., Monogr. viii, p. 19.—*Placostylus lamberti* CROSSE, t. c., p. 268 (1894).

Like typical *P. souvillei* in the simplicity of the outer lip and the open aperture, but more elongated and without spiral bands. Gassies' figure does not show the parietal tubercle alluded to in the text.

P. BOULARIENSIS (Souverbie). Pl. 13, fig. 4.

Shell imperforate, ovate-conic, elongate, solid, subcompressed, longitudinally rugose-plicatulate, striate; pale fleshy, covered with a tawny-chestnut cuticle, streaked with darker, and encircled with a few inconspicuous blackish spiral lines. Spire conic, with slightly convex outlines, the apex sub-acute; suture impressed, delicately crenulated, more or less denuded of cuticle, and whitish. Whorls 7, but little convex, the earlier 3 or 4 denuded of cuticle, pale fleshy, the penultimate whorl spirally obsoletely malleate striate; last whorl ascending, longer than the spire (being three-fifths the total length), rather long ovate, tapering basally, spirally inconspicuously striated or more or less malleate.

Aperture nearly vertical, rather long ear-shaped, angular above, vivid purplish-orange inside, becoming paler and somewhat green tinted far within, very glossy; peristome obtuse, scarcely reflexed outwardly, somewhat orange-tinted fleshy; the ends joined by a thick callus which bears a strong and rather acuminate tubercle in the middle; the right margin obtuse, thickened within at the insertion above the aperture, then narrower, broadly sinuated, and again thickened vertically; columellar margin nearly flat, bearing a long fold ascending to the tubercle.

Length 96, greater diam. 43, lesser 34; aperture 45 mill. long, 19 wide.

Length 95, greater diam. 44, lesser 36; aperture 48 mill. long, 18 wide.

Length 78, greater diam. 38, lesser 29; aperture 37 mill. long, 14 wide.

Woods around the Bay of Boulari (Lambert).

Bulimus boulariensis SOUV., Journ. de Conchyl. 1869, p. 417; 1870, p. 81, 422.—GASSIES, Faune Conch. N. C., ii, p. 60, pl. 1, f. 12, 1871.—PFR., Monogr. viii, p. 18.—*Placostylus boulariensis* CROSSE, J. de C., 1894, p. 265.—? ? KOBELT, l. c., p. 83, pl. 20, f. 1, 2, 1891.

This may prove to be a form of *P. fibratus*. Souverbie's type in the Bordeaux museum has not been figured, but Gassies figures a specimen from the same locality and doubtless authentic. I share Crosse's doubts of the authenticity of the specimens figured by Kobelt.

P. GUESTIERI (Gassies). Pl. 10, fig. 27; pl. 24, figs. 9, 11; pl. 25, figs. 15, 16.

Shell imperforate, ovate-conic, compressed from front to back, solid; white under a yellowish-chestnut cuticle, streaked with darker reddish or blackish chestnut. Surface sculptured with longitudinal growth-wrinkles (much too prominent in the figures) and lightly malleated spirally. Whorls $6\frac{3}{4}$–7, but slightly convex, the last one oval, ascending in front.

Aperture ovate, deep orange within or pale and ochreous in the throat; peristome yellowish-white or fleshy-white, broad, though hardly reflexed, thick, and blunt or keeled; the outer lip with a shallow sinus above; columella whitish, having a strong callous fold; parietal callus whitish, with a small or moderate whitish tubercle.

Length 86, diam. 40 mill. (type).

Length 97, diam. 53, aperture 63 mill.

Ouvea, Loyalty Is. (Lambert); *Mont-Dor* (Marie).

Bulimus guestieri GASSIES, J. de C., 1869, p. 72; Faune Conch. N.-C., ii, pp. 74, 192, pl. 3, f. 11; iii, p. 46.—PFR., Monogr. viii, p. 20.—*Placostylus guestieri* KOBELT, t. c., p. 69, pl. 17, f. 1.—CROSSE, Journ. de Conchyl., 1894, p. 266.—*Bulimus souvillei* var. *gatopensis* CROSSE, J. de C., 1870, p. 242 and 414.—*Plac. guestieri* v. *gatopensis* CROSSE, J. de C., 1894, p. 267, pl. 10, f. 2.—*Bulimus cicatricosus* GASSIES, Faune, ii, pl. 4, f. 2 (but not the descriptive text). *Placostylus cicatricosus* KOBELT, t. c., p. 90, pl. 22, f. 3, with var. *orientalis*, f. 1, 2.—CROSSE, J. de C., 1894, p. 269.—? *Placostylus* (*bavayi* var.?) *rhinocheti* KOBELT, t. c., p. 75, pl. 18, f. 1 (1891).

A smaller species than *P. souvillei*, with thicker peristome, and pallid columella and parietal callus. It is closely allied to *P. boulariensis*, *goroensis* and *buccalis*, and its union with the latter two may become necessary. Fig. 11 of pl. 24 is a copy of the original figure, which however represents a small form rather than the usual development of the species, which ordinarily attains a length of 90 to 100 mill. The var. *alba* is merely a white-lipped specimen; var. *major* being larger, length 110 mill. It is from Mont Dor. Which of the two localities given supplied the type is not known.

Var. *gatopensis* Crosse. (Pl. 24, fig. 10.) "A shell of medium size, with the spire denuded and roseate, the latter two whorls (and particularly the last) covered with a very peculiar greenish-olive epidermis, upon which some brownish and inconspicuous transverse

streaks may be distinguished. The peristome is orange excepting the columellar fold and the basal and outer margins, which are ivory white. The aperture is of a fine fire color, shading toward orange. Length 88–95, diam. 47–56 mill.; aperture with peristome 54–61 mill. long." (*Crosse.*)

Gatope and the "model farm," New Caledonia (Marie).

? Var. *confusus* Pilsbry. (Pl. 21, fig. 48.) Shell imperforate, solid, roughly striate, malleated throughout, the impressions sometimes in spirals; reddish, covered with an adherent greenish-brown cuticle more or less banded spirally. Last whorl slightly or hardly compressed, ascending in front. Aperture dark brown within; peristome white, unexpanded, lightly thickened, the margins joined by a thin, translucent callus; columella with an obsolete compressed white fold. Alt. 80, diam. 43, greatest length of aperture 45 mill.

Moindu, on the west coast of New Caledonia (Layard).

This is *P. cicatricosus* of Kobelt's monograph (p. 90). Possibly Gassies' figure pertains to the same form, but his description applies unquestionably to *P. kanalensis*. It differs from *P. guestieri* chiefly in being banded and more malleated.

? Var. *orientalis* Kobelt. (Pl. 21, figs. 49, 50.) Larger, thicker, the lip more thickened, lightly sinused above, the columellar fold stronger; bands more decided. Length 87, diam. 45, aperture 56 mill.

Huaila on the east coast (Layard).

? Var. *rhinocheti* Kobelt. (Pl. 21, fig. 46). Shell imperforate, compressed, angular along the two sides, solid, roughly and irregularly striate, covered with somewhat oblique, irregular and not very distinct transverse wrinkles; epidermis chestnut-brown. Whorls $6\frac{1}{2}$, the last one flattened below the suture and then inflated, slightly ascending in front. Aperture orange-brown within, white-margined; peristome unexpanded, thickened, a little expanded at the base, whitish, the terminations joined by a rather diffused, *toothless* callus; the outer margin angular and sinuated above, then straight, produced in the middle; columella subvertical, with an oblique, obsolete fold. Alt. 80, diam. 44, length of aperture with peristome 47 mill.

Kanala (Rossiter).

Placed by Kobelt in the group *P. bavayi*, by Crosse under *P. cicatricosus* Kob. as a variety. The toothless parietal wall and strong spiral sculpture are its chief differential characters.

P. SENILIS (Gassies). Pl. 10, fig. 30.

Shell much compressed, similar in general characters to *P. guestieri*, but larger, enormously thick and ponderous, the face of the lip built forward in a huge flange.

Alt. 111, diam. 58 mill. (specimen).

Alt. 129, diam. 65 mill. (Gassies' type).

Fossil; Islet Koutoumo and Isle of Pines, very abundant.

Bulimus senilis GASS., J. de C., 1869, p. 71; Faune ii, p. 65, pl. 2, f. 15; J. de C., 1880, p. 327, pl. 10, f. 3 (sinistral form).—PFR., Monogr. viii, p. 19; Nomencl. Hel. Viv., p. 216.—CROSSE, J. de C., 1873, p. 52.—*Placostylus senilis* KOBELT, Conchyl. Cab., p. 20, pl. 4, f. 1; pl. 5, f. 1, 2 (var. *minor*).

This extraordinary form scarcely differs specifically from *P. guestieri*, and the "var. minor" (pl. 20, fig. 42) figured by Kobelt, measuring 90 mill. in length, practically unites the two. Gassies has figured a sinistral example.

The specimens occur in a layer of sand which overlies the coral and is covered by humus. This layer is exposed by the uprooting of trees, as well as where the sea has encroached upon the land. The orange-red color of the interior often shows dimly, though the cuticle is lost and the surface more or less chalky.

Var. *subsenilis* (Gassies). Pl. 9, fig. 28.

Narrower and less compressed than *P. senilis*, the aperture more contracted by larger teeth. Length 110, diam. 55 mill.

Fossil, Isle of Pines (Lambert).

Bulimus subsenilis GASS., J. de C., 1878, p. 331; Actes Soc. Linn. Bordeaux 1880, p. 39, pl. 2, f. 1; Faune iii, p. 39, pl. 2, f. 1.—*Placostylus subsenilis* KOBELT, t. c., p. 49, pl. 12, f. 1 (copied from Gassies).

P. BUCCALIS (Gassies). Pl. 25, fig. 14.

Shell imperforate, ovate, long, solid, shortly acuminate, longitudinally streaked; transversely striate, strongly malleated; dirty whitish-roseate, the apex rose-tawny, obliquely streaked, shining, covered with a chestnut-buff epidermis ornamented with irregular brown longitudinal stripes, and worn off on the apex and ventral face; suture appressed, white. Whorls 7, convex, the last two-thirds the total length. Aperture large, long-ovate; peristome fleshy, thick, sinuated above, excavated, expanded and dentiform in the middle; colu-

mella spreading, with a conical descending fold, and connected with the outer lip by a thick callus; throat orange. Length 85, diam. 42, apert. 46 mill. (*Gassies*).

Ouen Island, *New Caledonia* (Déplanches, type locality); *Isle of Pines* (Déplanches).

Bulimus buccalis Gassies, Journ. de Conchyl., xviii, p. 141 (1870); Faune Conch. Nouv.-Caléd., ii, p. 58, pl. 5, f. 1 (1871).—Pfr., Monogr. viii, p. 20.—*Bulimus buccalis* var. *β scalaris*, Gassies, Journ. de Conchyl., xviii, p. 141 (1870); Faune Conch. Nouv.-Caléd. ii, p. 58 (1871).—*Placostylus buccalis* Gass., Crosse, Journ. de Conchyl., 1894, p. 268.

A "var. *scalaris*" (undescribed) and a sinistral specimen are on record. The color varies from that described to white under a yellow epidermis with spaced and strongly contrasting brown stripes, the epidermis being usually much worn. The peristome is very thick, the outer lip strongly thickened within in the middle, often more than shown in the figure, and the short columellar fold and parietal tooth are well developed. The peristome and parietal callus are sometimes almost white, and the interior a fine brownish-orange color. It is close to *P. guestieri*, but the epidermis is far paler, and the callosities of the somewhat less open mouth are better developed.

P. goroensis (Souverbie). Pl. 13, fig. 5.

Shell imperforate (subrimate), ovate-conic, compressed, solid, longitudinally rugulose-striate; white, covered with a somewhat olivaceous tawny epidermis, with occasional darker brown or more green streaks. Spire rather long, sub-convexly conic, the apex subacute; suture impressed, destitute of cuticle. Whorls 7, a little convex, the first 4 destitute of cuticle, whitish, the penultimate whorl subspirally malleate-striate, last whorl slowly ascending, longer than the spire (in the type, being 13–21 the length of the shell), spirally malleated, compressed, tapering basally.

Aperture subvertical, auriform, bluish-white within, porcellanous; peristome obtuse, scarcely reflexed, thickened, dull yellowish, glossy, the ends joined by a thick callus bearing a strong, rather deeply placed tubercle in the middle; right margin broadly sinuated above, basal margin produced forward, columellar margin subvertical, with a long fold above. (*Souv.*)

Length 105, diam. 54, length of aperture within 52 mill.

Goro, *New Caledonia* (Lambert).

Bulimus goroensis Souv., J. de C., 1870, p. 76.—Gassies, Faune, ii, p. 76, pl. 4, f. 3, 1871.—Pfr., Monogr. viii, p. 120.—*Placostylus goroensis* Kobelt, t. c., p. 103, pl. 25, f. 1, 2.—Crosse, J. de C., 1894, p. 266.

Differs from *P. souvillei* chiefly in the peculiar coloration, heavy lip and strong parietal tubercle.

Group of P. porphyrostomus.

P. submariei (Souverbie). Pl. 26, figs. 19, 20, 21.

Shell imperforate, short-ovate, very solid, brownish under a yellowish-chestnut cuticle, which is streaked with chestnut and sometimes spirally lineolate. Aperture flesh-tinted inside, shaped like that of *P. mariei*, except that *at the base of the columella there is a deep, rounded sinus*, abruptly truncating the calloused outer lip; often having some acute denticulation below the columellar fold.

Length 59, diam. 36 mill.

Length 63–64, diam. 37–39 mill.

Bondé, New Caledonia (Lambert).

Bulimus submariei Souv., Journ. de Conchyl., 1869, p. 273, with var. *abbreviata;* 1870, p. 76, pl. 9, f. 2.—Pfr., Monogr. viii, p. 119. —Gassies, Faune ii, p. 80, pl. 5, f. 2 (not typical).—*Placostylus submariei* Kobelt, t. c., p. 115, pl. 28, f. 2–4.

Shorter than *P. mariei*, from which it differs in the remarkable channel cut through the basal lip at the base of the columella. The "variety *abbreviata*" includes shorter specimens, length 57, diam. 37 mill.

P. mariei (Crosse & Fischer). Pl. 26, figs. 22, 23, 24.

Shell rimate, ovate, extremely solid and thick; whitish under a chestnut or yellowish-chestnut cuticle, which is obscurely streaked with darker, and in the typical color-form is multilineate spirally with brown. Surface nearly smooth, marked with slight growth-wrinkles. Spire conic, short. Whorls $5\frac{3}{4}$, but slightly convex, the last usually somewhat compressed from front to back, rather swollen.

Aperture vertical, its *longest axis oblique*, narrow and contracted, *pure white* or pale brownish within; peristome white, flesh-tinted or edged with yellowish-brown, *excessively thickened and built forward*, the outer lip extremely wide at the upper insertion, then excavated to form a rounded sinus, below which it gradually thickens to the base,

where the lip again becomes narrower; parietal callus extremely heavy, bearing a strong median fold; columella with an oblong and very strong callous fold.

Length 68, diam. 40 mill.

Length 67, diam. 36 mill.

Length 65, diam. 34 mill.

Gatope, west coast of New Caledonia (Marie).

Bulimus mariei C. & F., Journ. de Conchyl. 1867, p. 187, pl. 7, f. 1, 2, and variety, f. 3.—Gassies, Faune, ii, p. 78, pl. 5, f. 3.—Pfr., Monogr. vi, p. 83.—*Placostylus mariei* Kobelt, Conchyl. Cab., p. 19, pl. 3, f. 2–5; pl. 6, f. 5.—Crosse, J. de C. 1894, p. 277, with var. *simplex* Crosse and *curta* Gass.—*B. mariei* var. γ *curta* Gassies, J. de C. 1869, p. 274; Faune, ii, p. 78.—*Placostylus submariei* Kobelt, t. c., p. 17, pl. 3, f. 2 (1891).

A very solid species, allied to *P. porphyrostomus* but shorter, with the peristome more thickened, *the mouth pure white or very pale within*, and the much smoother surface covered to a far greater extent with epidermis. The basal lip has no trace of the notch which distinguishes *P. submariei*.

Variety *simplex* Crosse is based on specimens without brown spiral lines. Var. *curta* Gassies is shorter, length 60, diam. 38 mill., with the aperture narrower, the columellar fold approaching the callus of the lip. Both are from Gatope, and neither, probably, are true varieties in the sense of subspecies.

P. neckliaiensis Kobelt. Pl. 27, figs. 29, 30.

Shell slightly rimate, long-ovate, solid and thick, somewhat regularly costate-striate, sculptured with short spiral lines between the striæ; compressed; covered with a rather light olive-green, hardly streaked, cuticle. Spire conic, somewhat turreted, worn, flesh-colored; the apex small, slightly obtuse. Whorls 7, a little convex, regularly increasing, separated by a slightly crenate, white-margined impressed suture, the last whorl elongate but scarcely inflated, nearly double the length of the spire, irregularly compressed, ascending in front.

Aperture slightly oblique, narrow, contracted, brown inside; peristome very much thickened, bright fleshy-buff, margins connected by a very thick callus bearing a compressed crest in the middle, and an acute, somewhat entering tooth; the outer lip sinuated above, then rather straightly thickened; columellar margin vertically as-

cending, dilated, armed at its insertion with a thick, indistinctly doubled fold. Length 92, diam. 46, length of aperture with peristome 53 mill. (*Kobelt.*)

Neckliai, on the west coast of New Caledonia. (Unique type in Layard's collection.)

Placostylus (*mariei* var.?) *neckliaiensis* KOBELT, Conchyl. Cab., *Placostylus*, p. 116, pl. 28, f. 5, 6 (1891).—*P. neckliaiensis* CROSSE, J. de C., 1894, p. 279.

More lengthened than *P. mariei*, and differing in the spiral sculpture, which resembles that of *P. imbricatus*. It is probably nearest to *P. porphyrostomus*.

P. PORPHYROSTOMUS (Pfeiffer). Pl. 28, figs. 31, 32, 33, 34.

Shell imperforate, oblong-conic, very solid and heavy, whitish or flesh-pink, with slight traces of a thin yellow or brownish cuticle, *which is completely or almost worn off in adults*. Surface dull, rudely wrinkle-striate. Spire conic, the apex rather obtuse. Whorls about $6\frac{1}{2}$, slightly convex, the last not ascending in front.

Aperture vertical, contracted, deep blood-red or chocolate inside; peristome white, somewhat expanded, very much thickened and built forward, the outer lip with a moderate rounded sinus above, thicker toward the insertion, calloused again below the sinus; columella very broad, with a very heavy oblong tubercle above; parietal callus white, bearing a rather narrow tubercle, which is deeply placed and sometimes is small or wanting.

Alt. 74, diam. 32 mill.

Alt. 72, diam. 34 mill.

Alt. 59, diam. 28 mill.

Southern New Caledonia, from Bourail on the west to Goro on the east coast, including the southern islets, but wanting in localities deficient in lime, notably at South Bay. Common at Noumea and the I. of Nou (Marie).

Bulimus auris-bovina REEVE, Conch. Iconica, *Bulimus*, f. 185, 1848 (not of Bruguière).—*Bulimus porphyrostomus* PFEIFFER, Proc. Zool. Soc. London, p. 261 (1851); Monogr. iii, p. 377; iv, p. 446; vi, 82; viii, 117.—*Bulimus lessoni* PETIT, Journ. de Conchyl., iv, p. 404, pl. 11, f. 6 (1853).—*Bulimus porphyrostomus* GASSIES, Faune, Conch. Nouv.-Caléd., i, p. 43, pl. iv, f. 3, 1863; ii, p. 77, 1871.—CROSSE, J. de C., xii, p. 119, 1864.—MARIE, in J. de C., xviii, p.

384, 1870.—*Placostylus porphyrostomus* KOBELT, Conch. Cab. (edit. 2), *Placostylus*, p. 50, pl. 12, f. 2–5; pl. 13, f. 2, 3, 1891.—CROSSE, Journ. de Conchyl., 1894, p. 270.

Bulimus singularis MORELET, Test. Nov. Australiæ, p. 2, in Soc. Hist. Nat. Moselle, 1857.—*Bulimus porphyrostomus*, var. *singularis*, GASSIES, Faune, i, p. 44, pl. 4, f. 4, 1863; ii, p. 77, 1871.—*Bulimus porphyrostomus*, var. *β constricta*, CROSSE, J. de C., xii, p. 119, 1864.

Bulimus porphyrostomus, var. *abbreviata*, GASSIES, Faune, ii, p. 77, 1871.

The original specimen was immature, resembling my fig. 32 of pl. 28. With full maturity the cuticle completely disappears, or only some shreds remain; the lip thickens, the columella develops a heavy oblong or squarish callous tooth, and a tubercle appears on the parietal wall.

The form from the island of Nou is smaller, with darker, more persistent epidermis. Gassies mentions a var. *abbreviata* as "oviform, with buff-brownish epidermis."

Var. *singularis* Morelet. (Pl. 28, fig. 36.) The type is an old shell with strongly oblique aperture, narrowed and constricted by the thickening of the peristome; parietal tooth and columellar fold wanting. It is more extreme than the figure from Gassies shows, according to Crosse.

Var. DEBEAUXI (Gassies). Pl. 28, fig. 35.

Always perforate, with more regular, wider and open aperture, which is not placed so obliquely as in *porphyrostomus;* outer lip and columella less calloused, the former hardly sinused above. Alt. 78–80, diam. 36 mill. *Isle of Pines* (Lambert).

Bulimus debeauxi GASS., Faune, ii, p. 184 (1871); Journ. de Conchyl., p. 337, pl. 9, f. 4 (1881).—*P. debeauxi* CROSSE, J. de C., 1894, p. 272.

P. MONACKENSIS (Crosse). Pl. 27, figs. 26, 27.

"Larger than *P. duplex*, with the aperture paler inside, pale tawny; peristome strongly thickened, milk white. Length 79, diam. 35, apert. with perist. 38 mill. long, 25 wide."

Monack Island (type locality, Rossiter); *Isle of Pines* (Marie).

Placostylus duplex var. *monackensis* CROSSE, Journ. de Conch.

1887, p. 305.—*P. monackensis* Cr., KOBELT, t. c., p. 104, pl. 25, f. 3–5 (1891).—CROSSE, J. de C., 1894, p. 275, pl. 9, f. 4.—*Bulimus porphyrostomus* var. δ, *candida*, CROSSE, J. de C., 1874, p. 108, 183; 1875, p. 218, pl. 8, f. 2.—*Placostylus dautzenbergi* MARIE MS., according to Kobelt.

This form is considered by Crosse as combining the characters of *P. porphyrostomus* and *P. duplex*. It differs from *porphyrostomus* in its less dull shell, covered with rugosities and malleation more numerous and more pronounced; by its darker and more persistent epidermis; by the development of a very prominent columellar fold, sub-bifid interiorly and abruptly truncated at the base, instead of gradually tapering as in the other species; and finally, it differs by the broader aperture, which is less obliquely placed, and differently colored; the color of the interior of the aperture of *P. monackensis* being light, and varying between pure white, citron yellow and light orange yellow, while that of *P. porphyrostomus* is [generally] deep purple brown.

"*P. monackensis* differs from *P. duplex* in being more lengthened, more strongly malleated, the last whorl of the spire proportionally less inflated; by the development of the columellar fold, which is very prominent, sub-bifid interiorly and abruptly truncated below instead of being tapering as in *P. duplex*, and finally by the light color of the aperture, which in *P. duplex* is deep purple-brown as in *P. porphyrostomus*."

Fig. 26 is Crosse's type. Fig. 27 a rare white-mouthed form, originally described as a variety of *P. porphyrostomus*.

P. DUPLEX (Gassies). Pl. 29, fig. 41.

Shell imperforate, solid, longitudinally rugose-striate, strongly malleated; grayish-white under a yellowish-chestnut epidermis, ornamented with rippled chestnut lines which disappear above. Whorls 7. Aperture oblong-ovate, auriform, columella thick, spreading, with an oblong fold; the white parietal callus bearing a conical tubercle; outer lip deeply sinused above, very thick and reflexed below. Interior violet-purple, peristome white. Length 63, diam. 32 mill.

Island of Nou, New Caledonia (Marie).

Bulimus duplex GASS. Faune, ii, p. 64.—*Placostylus duplex* CROSSE, Journ. de Conchyl. 1894, p. 273, pl. 9, f. 3 (figure of type

specimen).—*B. duplex* var. *major* Gassies, l. c.—*P. duplex* Kobelt, Conchyl. Cab., p. 124, pl. 30, f. 4, 5.

Near to *P. porphyrostomus* Pfr., but the spire is more conic, the last whorl relatively more developed, epidermis more persistent, the surface less dull, and especially differing in the wider and less obliquely placed aperture.

Var. *major* Gassies. A subfossil form, chalky and white, destitute of epidermis, ponderous, thick and a little larger. Length 77, diam. 45 mill. *Alcmene Island, New Caledonia* (Marie).

This variety can hardly be identical with a specimen in Layard's collection from Nyapagio, in the vicinity of Bourail, which Kobelt figures as *P. duplex*. His figures are copied on my pl. 30, figs. 45, 46. This form seems to be broader and heavier, with a distinct superior lip sinus, and only a low columellar fold. It is solid and ponderous, and measures length 80, diam. 43 mill. It may be called var. *nyapagionis;* though whether referable to *duplex* or *porphyrostomus* is doubtful.

Kobelt mentions a *P. dautzenbergianus* in this connection, but no such species seems to be described.

Fig. 41 of pl. 29 represents Gassies' type specimen of *duplex*.

P. caledonicus (Petit). Pl. 29, figs. 37, 38, 39, 40.

Shell imperforate, irregularly ovate, very solid and thick; reddish under a strong cuticle, which varies from light yellowish green to blackish-chestnut. Surface rather glossy, with slight growth wrinkles and more or less conspicuous, shallow, spiral impressions. Spire conic, denuded. Whorls about 6, slightly convex, the last compressed from front to back, gibbous on the right side, sometimes even humped there; suture impressed, white-edged.

Aperture small, contracted, dark purplish-crimson or somewhat ochraceous within; peristome white or brownish, greatly thickened and built forward; the outer lip moderately or deeply sinuated above, below which a lobe of the margin is bent inward, widest above; basal margin narrow; columella heavy, thickened by a stout callus which is continuous or somewhat bilobed, and truncate above and below; parietal callus heavy, bearing a strong tooth.

Alt. 63, diam. 35–36 mill.

Alt. 69, diam. 38 mill.

Northern New Caledonia: *Hienguène, Congouma, Art Island, Balade* (Marie); *Pouébo* (Lambert); *Oubatchie* (Hedley).

Bulimus caledonicus Petit, Revue Zoologique, 1845, p. 53.—Pfr., Monogr. ii, 140; iii, 378; iv, 447; vi, 83.—Reeve, Conch. Icon., pl. 25, f. 163.—Philippi, Abbild. u. Beschreib., iii, p. 95, *Bul.* pl. 9, f. 2.—Deshayes in Fér., Hist., p. 117, pl. 138, f. 3, 4.—Gassies, Journ. de Conchyl., 1857, p. 273; Faune i, p. 44, pl. 5, f. 3; ii, p. 77.—Marie, J. de C., 1870, p. 382.—Crosse, J. de C., 1864, p. 121.—*Placostylus caledonicus* H. & A. Ad., Gen. Rec. Moll., ii, p. 153.—Tapparone-Canefri, Viag. "Magenta," p. 85.—Brazier, Proc. Linn. Soc. N. S. Wales, v, p. 190 (1881), with var. *edentula*. —Kobelt, Conch. Cab., p. 24, pl. 6, f. 1, 2.—Crosse, J. de C. 1894, p. 280.—Hedley, Proc. Linn. Soc. N. S. Wales, xxiii, 1898, p. 104.

P. pseudocaledonicus resembles this species, but it has no parietal tooth, the sinus of the lip is less deep, and neither the outer lip nor columella bear such heavy callosities. The color of *P. caledonicus* varies extremely.

Var. *edentula* Brazier. Wants the parietal tooth; peristome much thicker, and slightly reflected, a broad sinus above, aperture contracted in the middle. Columella, lip and interior of aperture bright dark red.

Coumac or *Kumac*, west coast of New Caledonia, in the Tiebagi mountain ranges. (Rossiter.)

P. poyensis Kobelt. Pl. 30, figs. 43, 44.

Shell imperforate, ovate-conic, compressed; solid, ponderous; irregularly plicate-striate, the last whorl marked with very fine waved spiral lines, visible under the lens, and here and there malleated and scarred; buff-whitish, covered with a chestnut-greenish epidermis, nearly uniform on the last whorl but streaked with darker on the penultimate. Whorls 7, suture white-edged, the penultimate whorl distinctly obliquely rugulate, the last compressed, somewhat gibbous on the left side, tapering at base.

Aperture vertical, brownish inside; peristome slightly expanded, doubly or triply thickened with a white, porcellanous callus; parietal callus toothless, brownish internally, rose-whitish outwardly; outer lip broadly sinuated above, then with a somewhat projecting tooth, and more thickened. Columella with a prominently truncated fold, twisted above, and interiorly peculiarly flatly-excavated and entering. Length 78, diam. 44. apert. 48 mill.

Poya, west coast of New Caledonia (Layard).

Placostylus (*pseudocaledonicus* var.?) *poyensis* KOBELT, Conchyl. Cab., *Placostylus*, p. 107, pl. 26, f. 3, 4 (1891).—CROSSE, Journ. de Conchyl., 1894, p. 276, with var. *goyettensis*, l. c., pl. 8, f. 5.

"An extremely critical form. E. A. Smith considers it a variety of *P. porphyrostomus;* Layard, on account of the columellar fold, a *P. mariei*. From the general form and peculiar coloration of the parietal wall, I can only place it in the immediate vicinity of *P. pseudocaledonicus*" (Kobelt).

Var. *goyettensis* Crosse. (Pl. 30, fig. 42.) Last whorl less inflated in the middle; aperture a little wider toward the base. Length 77, diam. 36 mill. (*Crosse.*)

Goyetta, near Coné, west coast of New Caledonia. (Marie.)

P. PSEUDOCALEDONICUS (Montrouzier). Pl. 31, figs. 10, 11, 12, 13, 14.

Imperforate or nearly so, ovate, solid; varying from reddish-chestnut to nearly black, the earlier whorls denuded and yellowish. Sculptured with slight growth-wrinkles and shallowly malleated circularly. Whorls nearly 7, the last usually compressed from front to back, and gibbous on the left side.

Aperture vertical, dark blood-red or purple-black within, the peristome white, brown-tinted or flesh-colored, with an inner border of orange-red; outer lip thick, with a slight or distinct sinus above, a moderate callous thickening below it, the basal lip narrow, columella wide, more heavily calloused above and below; parietal callus white, becoming red and then very dark within, toothless.

Alt. 68, diam. 33 mill.

Alt. 68, diam. 39 mill.

Alt. 60, diam. 30 mill.

Islands of Art (Montrouzier), and *Belep* (Marie); *Balade* (Montrouzier); *Bondé* (Marie).

Bulimus pseudo-caledonicus MONTROUZIER, Journ. de Conchyl., vii, p. 379, pl. 14, f. 3, 1859.—GASSIES, Faune Conch. Nouv.-Caléd., i, p. 45, pl. 5, f. 1, 1863; ii, p. 81.—CROSSE, J. de C., xii, p. 122, 1864; xv, p. 192, 1867.—PFR., Monogr. vi, p. 84.—MARIE, J. de C., xviii, p. 385, 1870.—*Placostylus pseudo-caledonicus* KOBELT, Conch. Cab., *Placostylus*, p. 22, pl. 4, f. 2, 5, 1891.—CROSSE, J. de C., 1894, p. 280, with the following varieties:

Var. *intermedia: Bulimus pseudo-caledonicus*, var. β, CROSSE, J. de C., xv, p. 193, 1867.

Var. *subulata: Bulimus pseudo-caledonicus*, var. γ, CROSSE, J. de C., XX, p. 193, 1867.—*Bulimus pseudo-caledonicus*, var. *nigra*, GASSIES, Faune, ii, p. 82, pl. 3, f. 7, 1871.

Var. *dentata: Bulimus pseudo-caledonicus*, var. β, GASSIES, Faune, ii, p. 81, pl. 7, f. 1, 1871.

Var. *pala: Bulimus pseudo-caledonicus*, var. δ, GASSIES, Faune, ii, p. 82, 1871.

Var. *rufa: Bulimus pseudo-caledonicus*, var. γ, GASSIES, Faune, ii, p. 82, 1871.

Var. *incerta: Bulimus pseudo-caledonicus*, var. ?, KOBELT, Conch. Cab., *Placostylus*, p. 26, pl. 6, f. 3, 4, 1891.

Var. *hybrida: Placostylus pseudo-caledonicus*, var. *hybrida*, KOBELT, Conch. Cab., p. 93, pl. 22, f. 6, 1891.

Var. *poumeana: Placostylus* (*pseudo-caledonicus*, *var.*) *Pouenanus*, KOBELT, Conch. Cab., p. 92, pl. 22, f. 4, 5, 1891.

Easily distinguished from *P. caledonicus*, by the far less developed callosities upon the outer lip and columella, and the absence or comparatively small development of the parietal tooth.

Var. *intermedius* Crosse, 1867. Rather elongated and a little larger, with 7 whorls. Length 73, diam. 42½ mill. Var. *subulatus* Crosse (*nigra* Gassies, pl. 31, fig. 11) is slender, a little smaller, with 7 whorls. Length 68, diam. 32 mill. Art Island. Var. *dentatus* Gassies (pl. 31, fig. 14) has a small parietal tooth. Art Island. Var. *palus* Gassies is gray, destitute of cuticle, with the aperture livid violaceous. Art Island. Var. *rufus* Gassies, is covered with a yellowish-brown cuticle, the suture white, generally with two zones and ornamented with irregular lines. It is from Art Island, and may be a form of *P. scarabus*. Var. *incertus* Crosse (pl. 10, figs. 28, 29), "unites the marking and form of the last whorl of *P. scarabus*, the form of the outer lip of *P. caledonicus*, and the characteristic concave columellar fold of *P. pseudo-caledonicus*." Var. *hybridus* Kobelt (pl. 31, fig. 13) "differs from the type by its more ovate, not ovate-conic, shell, lighter olive-brown epidermis, and subobsolete columellar fold and callus of the outer lip. Alt. 57, diam. 33, apert. 35 mill." Var. *pouenanus* Kobelt (pl. 31, fig. 12) has the mouth characters of *pseudocaledonicus*, but differs markedly in the more cylindric spire, want of oblique wrinkle-sculpture on the penultimate whorl, and it lacks the characteristic color of the aperture, which in *pouenanus* is light brown within, the peristome brownish, paler outwardly, or

rarely the aperture and lip are white, as in *P. mariei*. It is from the Poume peninsula, on the west coast of New Caledonia, and the name is emended to v. *poumeana* by Crosse.

Var. *chrysochila* (Crosse). Pl. 32, figs. 22, 23.

"Imperforate, ovate-acute, covered with a black-chestnut epidermis, nude and buff-whitish above. Whorls $6\frac{1}{2}$; aperture irregularly oblong, slightly narrowed and somewhat rectangular at the base, orange within, vivid purplish-orange just within the peristome; peristome orange, less thickened than in the typical form of *pseudocaledonicus*. Length 65, diam. 34, apert. with perist. 40 mill. long."

Gatope (type locality; Marie), *Ouagap; Nekete* (Vieillard, Déplanches).

Bulimus pseudocaledonicus var. *chrysochila* Crosse, Journ. de Conchyl., 1870, p. 243.—*B. annibal* Gassies, Faune, ii, pl. 6, f. 3 (1871).—*B. gaudryanus* Gassies, Journ. de Conchyl., 1878, p. 335; Faune iii, p. 38, pl. 1, f. 24 (1880).—*Placostylus gaudryanus* Gass., Kobelt, t. c., p. 95, pl. 23, f. 3, 4 (1891).—*P. annibal* var. *chrysochila* Crosse, J. de C., 1894, p. 285.

Fig. 23 is Gassies' illustration of the synonymous *B. gaudryanus*.

Var. *annibal* (Souverbie). Pl. 32, figs. 19, 20, 21.

Imperforate or subrimate, somewhat compressed, longitudinally wrinkle-striate or wrinkle-plicatulate, pale flesh colored under a brownish-chestnut epidermis, which is more or less dark, and streaked with a darker shade, very rarely with some blackish spiral lines. Whorls 7, the penultimate and preceding ones obliquely striate-malleate, the last whorl more or less conspicuously submalleate.

Aperture purplish-orange near the lip, bluish in the throat; peristome obtuse, thickened inside, pale fleshy-white, sometimes rather buff or somewhat orange, the terminations joined by a thick callus bearing a small, deeply situated tubercle in the middle; outer lip broadly sinused above, columella straightened, sometimes tuberculate below.

Alt. 71, diam. 36 mill.; alt. 64, diam. 32 mill.; alt. 75, diam. 34 mill. *Bondé* (Lambert).

Bulimus annibal Souv., Journ. de Conchyl., 1869, p. 416; 1870, p. 78, pl. 9, f. 3, 3*a*.—Gassies, Faune, ii, p. 83, pl. 6, f. 1, 2 (1871). Pfr., Monogr. viii, p. 116.—*Placostylus annibal* Kobelt, t. c., p. 94, pl. 23, f. 1, 2 (1891).—Crosse, J. de C., 1894, p. 284.

Var. *saxtoni* "Layard" Kobelt. Pl. 33, figs. 8, 9.

Very narrowly rimate, solid and ponderous, compressed from front to back, smoothish, irregularly wrinkled with growth-lines, and slightly malleated circularly; covered with a chestnut cuticle streaked with darker and yellowish, the spire and a subsutural band denuded. Whorls $6\frac{1}{2}$ or 7, the last gibbous on the left side. Aperture contracted, orange-red within; peristome whitish, shading to a peculiar golden-orange color toward the inner edge of lip, columella and parietal wall. Outer lip very much thickened, having a deep rounded sinus above, below which the outer lip bears a heavy, inflexed callus; columella straight in the middle, with a tubercle at each end. Parietal wall toothless.

Alt. 75, diam. 40 mill.

Alt. 70, diam. 41 mill.

Alt. 58, diam. $34\frac{1}{2}$ mill.

Coumac, west coast of New Caledonia (Layard).

Placostylus saxtoni Layard, Kobelt, Conchyl. Cab., p. 97, pl. 23, f. 5, 6 (1891).—Crosse, J. de C., 1894, p. 283.

The decidedly different tint of the inner edge of the peristome, and the stronger callus of the outer lip, distinguish this variety from *P. pseudocaledonicus*.

P. scarabus (Albers). Pl. 31, figs. 16, 17; pl. 27, fig. 28.

Imperforate or rimate, ovate, solid and ponderous; *light brown, with many conspicuous encircling chestnut lines and bands*, the spire denuded. Surface sculptured with low growth-wrinkles. Whorls $6\frac{1}{2}$, the last rather obese, ascending in front.

Aperture oblong, dark purplish within, usually becoming red-orange in the throat; peristome thick and obtuse, *white;* the outer lip more or less sinused above, thickened below the sinus; columella oblique or vertical, generally bearing a short fold close to the upper insertion, and separated from it by a groove; the base more or less distinctly truncated. Parietal wall covered with a strong white callus, which becomes abruptly thin within, and bears the small rudiment of a median tooth.

Alt. 57, diam. 33 mill. Alt. 60, diam. 32 mill.

Art Island (Montrouzier); *Belep Is.* (Marie); *Arama*, to the N. of Balade; *Poume peninsula* (Gassies); *Baaba I.*, west coast of New Caledonia (Debeaux).

Bulimus scarabus Albers, Malak. Bl. i, p. 219 (1854).—Pfr., Novit. Conch. i, p. 12, pl. 4, f. 12, 13; Monogr. iv, p. 447; vi, 84; viii, 120.—Gassies, Faune, i, p. 46, pl. 5, f. 2; ii, p. 82.—Crosse, J. de C., 1864, p. 123.—Marie, J. de C., 1870, p. 385.—Fischer, J. de C., 1871, p. 161–166, pl. 7, f. 5–8) (jaw, teeth and genitalia). —*Placostylus scarabus* Schmeltz, Mus. Godeffroy Catal. v, p. 93.—Kobelt, t. c. p. 10, pl. 1, f. 2, 3.—Crosse, J. de C., 1894, p. 286, with var. *tanouensis*, pl. 10, f. 3.—*B. scarabus* var. *tanouensis* Crosse, J. de C., 1869, p. 179.

A more compact, stouter species than *P. pseudocaledonicus*, always ornamented with bands and lines. Kobelt mentions a specimen 65 mill. long.

Var. *tanouensis* Crosse (pl. 31, fig. 15). Aperture pale buff inside, the peristome entirely milk white, except that the interior of the columella is purple-brown. Length 53, diam. 31 mill.

Tanou, one of the Nenemas Is., New Caledonia (Marie).

Var. *Smithii* Kobelt. Pl. 33, figs. 5, 6.

Shell imperforate, ovate, thick, ponderous, rudely obliquely plicate-striate, the lower whorls made granulous by very delicate, waved lines, visible under the lens; whitish covered with a greenish-brown, well-preserved epidermis, which is indistinctly zoned spirally and distinctly streaked and banded with chestnut-brown on the antepenultimate whorl. Spire convexly conic, the apex buff, slightly obtuse. Whorls 6, regularly increasing, separated by an impressed, strongly crenulate and white-margined suture; the last whorl subangular, slightly compressed, strongly ascending in front.

Aperture vertical, the base receding, elongate, ovate-auriform, vivid orange-brown within; peristome reflexed, very much thickened, white, the ends joined by a very thick, toothless callus, ridged longitudinally; white outwardly, brownish inwardly; outer lip sinuated above; columellar lip depressed, dilated, armed with a compressed, but little prominent columellar fold, white outwardly, orange-brown within. Alt. 73, diam. 45, alt. aperture 48 mill. (*Kobelt*).

West coast of New Caledonia (Saxton.)

Placostylus smithii Kobelt, Conchyl. Cab., p. 105, pl. 26, f. 1, 2 (1891).—Crosse, J. de C. 1894, p. 287.

Described from a single specimen in Layard's collection. It differs from *P. scarabus* in wanting distinct spiral color bands on the last whorl, in the convex columellar fold and in the larger size.

In many specimens of *P. scarabus* the parietal callus has a low longitudinal ridge, inside of which the color abruptly changes.

Var. *goulvainensis* Kobelt. Pl. 33, fig. 7.

Rudely and irregularly costate-striate, malleated; rose-white covered with a yellowish-brown epidermis streaked with darker. Last whorl compressed, distinctly angulated on the left side, ascending in front. Aperture bright orange-brown inside, peristome scarcely expanded, thickened, white; parietal callus reddish changing to brownish within. Columellar margin dilated, bearing a prominent, compressed, hardly entering fold.

Alt. 64, diam. 38, alt. apert. 39 mill.

Near Cape Goulvain, west coast of New Caledonia (Saxton).

Placostylus goulvainensis Kobelt, t. c., p. 109, pl. 26, f. 5, 6 (1891).—*P. smithii* var. *goulvainensis* Crosse, J. de C., 1894, p. 287.

Section *Leucocharis* Pilsbry, 1900.

Slender, thin, arboreal forms, white or but slightly guttate, *only* $1\frac{1}{2}$ *apical whorls pitted.*

These forms have no close relationship with *Charis* and *Aspastus*, with which Crosse associates them. They are peculiar in the reduction of the nepionic pitted shell to $1\frac{1}{2}$ whorls. They seem to have no closer affinity with species of other island groups than the common bond uniting all the Placostyles; the slender contour, light texture and pale color being purely adaptive characters, assumed with arboreal habits and independently, by various species of *Placostylus* and of other groups of land snails.

P. pancheri (Crosse). Pl. 33, figs. 1–4.

Shell compressed-umbilicate, oblong-fusiform, thin, *gray-white;* surface shining, sculptured with slight growth-striæ and on the last whorl, *close, irregular, frequently anastomosing or interrupted, spiral, white wrinkles.* Spire rather slender, the apex rather obtuse; early whorls hardly punctate. Whorls $4\frac{1}{2}$, quite convex, the last more inflated; suture often narrowly margined.

Aperture oval, gray-white inside; peristome thin, narrowly reflexed, white; columella dilated above, typically orange-brown; the fold not visible from in front, being slender and deep-seated.

Alt. 36, diam. $16\frac{1}{2}$, length of aperture 21 mill.

New Caledonia: Boulari, in the mountains (Pancher); *environs*

of Mont Dor, in the interior (E. Marie); *Prony Bay* (Brazier); arboreal.

Bulimus pancheri Crosse, Journ. de Conchyl., 1870, p. 137, 411, pl. 13, f. 7; var. β, Crosse, J. de C., 1872, p. 226; 1874, p. 102, pl. 2, f. 5.—Gassies, Faune Conch. N. Caléd. ii, p. 91, pl. 8, f. 17 (1871).—Pfr., Monogr. viii, p. 60.—*Placostylus pancheri* Kobelt, Conch. Cab., p. 12, pl. 1, f. 6, 7, and var. β, p. 13, pl. 1, f. 8, 9.—Crosse, J. de C., 1894, p. 295, with var. *candida*.

Not closely allied to any other species except the more slender *P. loyaltyensis*. In the typical form the columella is orange-brown, but in the more abundant color-var. *candida* Crosse (pl. 33, figs. 1, 4) the whole peristome and shell are white.

P. loyaltyensis (Souverbie). Pl. 43, figs. 7, 8, 9, 10.

Shell perforate, fusiform, thin, grayish-white with sparsely scattered translucent gray dots and spots or streaks, bordered on the left with opaque white. Surface shining, lightly striate, and inconspicuously grooved spirally, the spirals often subobsolete. Spire slender, the apex obtuse; early whorls very superficially pitted. Whorls $4\frac{1}{2}$, moderately convex, the last oblong, slender. Suture narrowly margined.

Aperture oblong-ovate, white within; peristome expanded, white; columella dilated above, with a weak entering fold.

Alt. 29–32, diam. 13, length of aperture 17–$18\frac{1}{2}$ mill.

Maré, Loyalty Is. (Montrouzier).

Bulimus loyaltyensis Souv., Journ de Conchyl., 1879, p. 25, pl. 3, f. 1, and var., f. 2.—Gassies, Faune, iii, p. 42, pl. 4, f. 2 (var.).—*Placostylus loyaltyensis* Kobelt, Conchyl. Cab. p. 32, pl. 7, f. 6–9.—Crosse, J. de C., 1894, p. 296, with varieties *subaurantiacofulvida* and *lactea*.

Allied to the preceding species, but of much more slender form. The typical form is white with an orange-brown collumella; the variety *subaurantiacofulvida* is a pale orange-fawn tint with numerous small fawn or transparent white spots, the columella orange-brown; var. *lactea* is milk white with inconspicuous translucent spots, the entire aperture white. These are doubtless mere variations, not truly varieties. In one of the specimens before me there is a faint sulphur tint within the outer lip.

Species of the New Hebrides Archipelago.

These imperfectly explored islands have representatives of three groups of *Placostylus:* terrestrial species of the *fuligineus* group, allied to the New Caledonian *P. bavayi* and its allies; second, presumably arboreal species of the *P. hartmani* group, resembling Vitian and Solomon forms in their ovate contour and slender, conic spire, but smoothish, with longitudinally lineolate cuticle, sometimes cut into spiral bands or eroded; and third, the subgenus *Diplomorpha*, consisting of forms of reduced size and short, compact, *Partula*-like shape, but retaining the apertural characters and color, and the apical sculpture of true *Placostylus*.

1. Shell solid and strong, imperforate or merely rimate; peristome not much expanded. Section *Placostylus*.

2. Shell thin, perforate, the aperture ovate, lip well expanded. Section *Pœcilocharis*, p. 73.

Section *Placostylus* (Group of *P. fuligineus*).

The species are figured on plates 6, 7, 8, 11, 14, smaller figures only.

a. Base of shell rounded or tapering, without a spiral ridge around the umbilical region.

b. Columella rather slender, adnate; shell distinctly malleated or lirate spirally; spire conic, rather acute; length about equal to or exceeding twice the diam. *fuligineus*, p. 70.

*b*¹. Columella heavy, concave above, truncate below, the outer edge adnate; sculpture indistinct; spire short and obtuse. *heterostylus*, p. 72.

*b*². Columellar lip rising free, flattened on its inner face; diameter over half the length. *salomonis*, p. 69.

*a*¹. A ridge encircling the umbilical region, and producing a fold on the inner lip; penultimate whorl bulging; form rather slender. *alienus*, p. 72.

P. salomonis (Pfeiffer). Pl. 6, figs. 6, 7, 8, 9.

Shell rimate, oblong-conic, rather solid and strong, streaked chestnut and yellowish, becoming pale or reddish on the earlier whorls. Surface slightly glossy, irregularly and closely wrinkle-striate, the wrinkles usually more or less cut into spiral rows of long granules in places, though such spiral sulcation as exists is very shallow. Spire

conic, the apex rather obtuse. Whorls $4\frac{3}{4}$ to 5, convex, the last one large, somewhat obliquely produced, convex, sometimes shallowly furrowed at the periphery.

Aperture subvertical or slightly oblique, ovate, *orange colored within*, becoming pale in the throat; peristome a little expanded, more or less thickened within and on its face, orange with whitish edge; outer lip straightened and sloping, often strongly arcuate above, Columella nearly straight, concave above, twisted or weakly plicate below the middle, slightly or not truncated at the base; *its edge greatly thickened, flattened within, rising high and free above the umbilical chink*. Parietal callus thin or moderate.

Alt. 36, diam. 20, length of aperture 22 mill.

Alt. 33, diam. 19, length of aperture 22 mill.

New Hebrides: *Erromanga*.

Partula salomonis Pfr., P. Z. S., 1852, p. 137; Monogr. Hel. Viv. iii, 446; iv, 510.—*Bulimus salomonis* Pfr., Conchyl. Cab., p. 276, pl. 66, f. 10, 11; Monogr. vi, 85.—Dohrn, Malak. Blätter 1862, p. 213.—Crosse, Journ. de Conchyl., 1864, p. 131, pl. 7, f. 5.—*Bulimus pyrostomus* Pfr., P. Z. S., 1860, p. 137; Mal. Blätter, 1861, p. 15.—*Placostylus salomonis* Tapparone Canefri, Viaggio "Magenta," p. 85.—*Placostylus pyrostomus* Pfr., Kobelt, Conchyl. Cab., p. 68, pl. 16, f. 5–8.

The orange color of the lip and columella within is more extensively diffused than in *P. fuligineus*, and the columellar lip is flattened on its inner face and rises free above the umbilical chink.

The variation in form is great, as the figures show. Sometimes the outer lip is built out far beyond the expansion; and the columellar chink may be either wide or closed.

A shell referable to *P. salomonis* as a variety is shown in fig. 9 of pl. 6. It has somewhat over 5 whorls, a heavy parietal callus and small aperture, other features being as in *salomonis*. Alt. $36\frac{1}{2}$, diam. 18, length of aperture 20 mill. The aperture is quite oblique. Kobelt mentions specimens 43 mill. long.

The identity of *salomonis* and *pyrostomus* is generally acknowledged. It was originally thought to be from the Solomon Is.

P. fuligineus (Pfeiffer). Pl. 11, figs. 2, 3, 4; pl. 14, figs. 9–12.

Shell imperforate, oblong, solid though not very thick, chestnut-brown or dark brown, with some darker and lighter streaks, the spire

paler, brown or olivaceous; earlier two or three whorls denuded and dull red. Surface dull or somewhat shining, irregularly wrinkled longitudinally and more or less distinctly decussated by coarse, shallow spiral sulci; a strong lens showing a dense, minute, criss-cross scratching of the whole surface. Spire conic, the apex rather acute. Whorls $4\frac{1}{2}$ to 5, convex, the last a little compressed peripherally, and usually having a depression or sulcus plowed along the periphery, following it for some distance behind the lip.

Aperture subvertical, more than half the shells length, bluish inside, the peristome slightly expanded, a trifle thickened within, yellow or orange colored; outer lip straightened or even bent in near the middle. Columella nearly straight, moderately reflexed and adnate, a little twisted, not truncated below, but with a more or less obvious projecting angle where it meets the somewhat retracted basal lip. Parietal callus thin and colorless.

Alt. 40, diam. 19, length of aperture 24 mill.

Alt. 37, diam. $17\frac{1}{2}$, length of aperture 21 mill.

Alt. 37, diam. 19, length of aperture 22 mill.

New Hebrides: *Aneiteum* (Macgillivray).

Bulimus fuligineus Pfr.; P. Z. S., 1852, p. 85; Conchyl. Cab., p. 157, pl. 48, f. 5, 6; Monogr. iii, 301; iv, 363; vi, 85.—Crosse, Journ. de Conchyl., 1864, p. 129, pl. 7, f. 4.—*Placostylus fuligineus* Kobelt, Conchyl. Cab., p. 44, pl. 10, f. 5–8, and *var.*, p. 74, pl. 17, f. 8.

A thinner shell than *P. salomonis*, with the columellar lip simply reflexed and adnate, not elevated as in the other species. *P. fuligineus* is moreover usually darker and more conspicuously sulcate spirally.

Pl. 11, fig. 2, is Pfeiffer's type, which is an unusually narrow example, while figures 9, 10 of pl. 14 shows a shell more swollen below the suture than the average. Figures 3, 4 of pl. 11 are perhaps the more normal form. Kobelt's figures (copied on my pl. 14, figs. 11, 12) look considerably like my *P. heterostylus*.

Pfeiffer describes a var. β as tawny with reddish apex, the peristome pale, columellar margin dilated and appressed. It is from Aneiteum. Kobelt figures a specimen in the Berlin Museum which Mr. E. A. Smith refers to Pfeiffer's variety (see pl. 6, fig. 10). It is 35 mill. long, and resembles *Strophocheilus rosaceus* in appearance. I would consider it a doubtful member of the species.

P. HETEROSTYLUS Pilsbry. n. sp. Pl. 7, figs. 11, 12.

Shell imperforate, oblong-oval, solid and strong, uniform olivaceous brown, or yellowish with brown streaks, the earlier whorls and usually a subsutural strip denuded of cuticle, the spire dull red. Surface smoothish, with slight growth-wrinkles which in places are interrupted, giving the appearance of subobsolete spiral sulci, and often with some impressed sulci plowed upon the surface of the last whorl; a strong lens showing a dense criss-cross scratched microscopic pattern. *Spire short*, the apex obtuse, whorls $4\frac{1}{4}$ to $4\frac{1}{2}$, convex, the last oval.

Aperture oblong-ovate, blue in the throat, dirty yellowish or nearly white near and upon the peristome; peristome blunt, slightly expanded, thickened within; *columella heavy, concave above, decidedly truncated at base*, its edge reflexed and adnate. Parietal callus moderate or heavy, transparent or white.

Alt. $35\frac{1}{2}$, diam. $18\frac{1}{2}$, length of aperture 22 mill.

Alt. 32, diam. 17, length of aperture 20 mill.

New Hebrides.

Allied to *P. fuligineus*, but less wrinkled, the spiral sulci almost obsolete, and with much shorter, more obtuse spire, only $4\frac{1}{4}$ to $4\frac{1}{2}$ whorls, and much heavier and truncated columella.

P. ALIENUS Pilsbry. Pl. 8, figs. 18, 19.

Shell imperforate, subcylindrical, with conical spire, very solid, the body-whorl buff (denuded of cuticle in the type), spire tawny. Surface with slight growth-wrinkles, stronger below the sutures. Whorls $4\frac{1}{2}$, convex, the penultimate whorl much more convex, bulging, the last whorl contracted, with a shallow peripheral sulcus on its latter third, tapering toward the base, where a strongly convex ridge or basal fasciole borders the umbilical region.

Aperture slightly exceeding half the total length of the shell, somewhat oblique, oblong ovate, ochre tinted inside, becoming orange toward the lip; peristome expanded, thick, very heavily calloused within, the callus orange; face of the lip convex, thickened; columella arcuate, reflexed, a little flattened as in *P. salomonis;* just above its junction with the parietal wall there is a strong fold, produced by the strong crescentic ridge which encircles the columella immediately behind the reflexed columellar lip.

Alt. 29, diam. 14 mill.; alt. of aperture $16\frac{1}{2}$, width 10 mill., inclusive of peristome.

New Hebrides (Cox).

Placostylus alienus Pils., Nautilus vi, p. 116 (Feb., 1893).

Smaller and narrower than any other species of the New Hebrides, and with a conspicuous cord encircling the columella, producing a fold just above the junction of the columella with the parietal wall. Only remnants of a thin yellowish cuticle remain on the type specimen, but Dr. J. C. Cox states that he has "one specimen with a thin brown epidermis on it, another with the mouth quite pale colored."

Section *Pœcilocharis* Kobelt. Group of *P. hartmani*.

These forms somewhat resemble the arboreal members of the Section *Placocharis*, of the Solomon Islands.

a. Cuticle longitudinally streaked, *P. hartmani*, *bicolor*, *francoisi*.

a^1. Cuticle spirally banded, *P. turneri*, *hebridarum*.

P. HARTMANI Kobelt. Pl. 45, figs. 8, 9, 10, 11, 12.

Shell compressed-umbilicate, long-ovate, rather thin; whitish under a pale brown cuticle, streaked with chestnut, the spire denuded, bright orange colored. Surface smooth save for slight growth-striæ. Spire conic, the apex slightly obtuse; whorls $4\frac{1}{2}$ convex, the last inflated.

Aperture purplish-white within, ovate, acuminate above; peristome thin, broadly expanded and reflexed, white, the outer lip evenly arcuate, columellar lip reflexed, vertical; columella concave below, with a weakly convex long fold above; parietal callus transparent, white.

Alt. 31, diam. 18, length of aperture 23 mill. (Hartman's type).

Alt. 40, diam. 21, length of aperture 25 mill. (Kobelt).

New Hebrides; "*Aura*" *Island* (Layard); *Santo Esperito* (Dr. Francois).

Charis rossiteri Hartman, Proc. Acad. Nat. Sci. Phila., 1889, p. 91, pl. 5, f. 2, 2 a (June 18, 1889); not *Bul. rossiteri* Brazier, 1881. — *Placostylus* (*Charis*) *hartmanni* Kobelt, Conchyl. Cab. p. 78, pl. 18, f. 7–9.—J. Mabille, Soc. d'Hist. Nat. d'Autun, viii e Bulletin, p. 410, (1895).

My description and figures 8–10 are from Dr. Hartman's type in coll. Acad. Nat. Sci. Kobelt describes fine spiral striæ, which are wanting on this specimen, and his shell has a stronger columellar

fold. He proposes a subgenus *Pœcilocharis* for the species. The doubling of the terminal *n* of Dr. Hartman's name is evidently an error (quite pardonable in a German), which I have not thought it amiss to correct.

P. BICOLOR (Hartman). Frontispiece, figs. 1, 2, 3, 4.

Shell broadly and deeply rimate, ovate, thin but moderately strong; the type denuded, the last whorl whitish, the spire orange-red, but showing traces of a thin, pale-yellow cuticle with narrow dark brown streaks or lines. Surface rather irregularly wrinkle-striate, with faint, fine spiral striation in places. Spire short, conic, the apex acute. Whorls slightly exceeding 4, rapidly widening, moderately convex, the last quite convex below the suture and at the sack-like base, the suture less oblique anteriorly. Aperture vertical or even with the base a little produced forward, ovate, bluish-white within; peristome buff, expanded and very narrowly recurved, a little thickened; the columellar margin reflexed, a little sinuous. A small, deep-seated fold may be seen by looking obliquely into the aperture. Parietal wall bearing a transparent, whitish callus, faintly thickened in the middle.

Length 34½, diam. 20, longest axis of aperture with peristome 21½ mill.

Alt. 41, diam. 21, alt. aperture 27 mill. (Kobelt).

Aura Island, New Hebrides (Layard).

Charis bicolor HARTM., Proc. Acad. N. S. Phila., 1889, p. 91, pl. 5, f. 1, 1a.—*Placostylus* (*Charis*) *bicolor* KOBELT, Conchyl. Cab., p. 81, pl. 19, f. 5, 6.—J. MABILLE, Soc. d' Hist. Nat. d'Autun, 1895, p. 410.

The figured type is here described and illustrated (figs. 1–3). Like all the specimens known, it is weathered and almost totally denuded of cuticle, with the surface somewhat corroded. Kobelt figures and describes a larger specimen, more slender, with 4½ whorls and a much more distinct parietal nodule (fig. 4). The lineolate cuticle and orange spire allies this to *P. hartmani*, which differs in being more slender with broadly flaring lip and a far longer aperture. It is only superficially similar to the Vitian *P. ochrostoma*. Hartman's label reads "Santo Island, near Aura Island."

P. FRANCOISI J. Mabille. *Unfigured.*

Shell broadly or rather narrowly perforate, ovate-oblong, but

little thickened, subpellucid, rather shining. Very delicately longitudinally striated and a little malleated, seen under the lens to be marked with subimpressed descending lines. White under a brown epidermis marked with chestnut wrinkles. Spire short, high-conic, slightly obtuse, roseate or corneous, slightly exceeding a third the total length of the shell. Whorls 5, convex, the first decorticated, punctulate and shining, the last large, long-ovate, a little inflated, the suture slowly and regularly descending in front.

Aperture ovate, nearly vertical, dull whitish inside; peristome a little thickened, spreading, reddish inside; columellar margin expanded, covering the umbilicus. Alt. 32–38, diam. 16–18 mill. (*Mab.*).

New Hebrides: *Santo Island* (Dr. François).

Placostylus (*Charis*) *françoisi* Mab., Société d'Hist. Nat. d'Autun, viii, Bulletin, 1895, p. 410, no. 89.

P. turneri (Pfeiffer). Pl. 45, fig. 5.

Shell imperforate, ovate-acute, succinea-like, thin, striatulate; corneous-whitish, ornamented with olive-brown bands, streaked with darker. Spire conic, rather acute. Whorls 4, a little convex, the last more than two-thirds the total length of the shell, slightly narrowed at the base. Columella compressed, callous, thread-like. Aperture a little oblique, acuminate-oval, glossy within; peristome simple, thin, narrowly expanded, the right margin somewhat flexuous, columellar margin adnate. Length 32, diam. (above aperture) 17 mill. (*Pfr.*).

New Hebrides: *Erromanga I.* (Mr. Turner).

Bulimus turneri Pfr., P. Z. S., 1860, p. 138, pl. 51, f. 10; Malak. Bl., 1861, p. 11; Monogr. vi, p. 9; Nomencl. Hel. Viv. p. 284 (as *Rachis*).

P. hebridarum J. Mabille. *Unfigured.*

Shell perforate, subturreted-elongate, thin, subpellucid, longitudinally very delicately striated, marked with inconspicuous descending impressed lines, somewhat shining; reddish-gray, the last whorl ornamented with more or less wide, brown zones. Spire raised, reddish, much exceeding a third of the shell's length. Whorls 5, convex, little impressed at the sutures, regularly increasing, separated by an impressed suture; the last whorl large, rather cylindric and lengthened, regularly descending.

Aperture nearly vertical, ovate, white and obscurely zoned within; peristome somewhat thickened, rose-bordered, a little reflexed, the outer margin a little reflexed at first, then curved; columellar margin dilated, thickened, covering the umbilicus. Alt. 36–38, diam. 16–17 mill. (*Mab.*).

New Hebrides: *Santo Island* (Dr. François).

Placostylus (*Charis*) *hebridarum* Mab., Soc. d' Hist. Nat. d' Autun, viii e Bulletin, 1895, p. 410, no. 90.

Seems to have the color-pattern of *P. turneri*.

Species of eastern New Guinea.

P. remotus Hedley. Pl. 11, fig. 9.

Shell an elongated cone, narrow in proportion to length, thick and strong, anteriorly broad and blunt, posteriorly tapering slowly; scarcely perforate. Color pale ochre with a darker broad peripheral band, which is edged above and below with a pale border, and a narrow, dull white margin below the suture. Whorls 6, rounded; apex blunt, nepionic shell a whorl and a half. Suture impressed. Sculpture: everywhere irregularly crossed by oblique growth lines, both fine and coarse, which interrupt and distort a series of minute, numerous, irregular spiral scratches which are not to be perceived without a lens (see detail fig. 9). Aperture oblique, rudely hexagonal, subchannelled anteriorly. Columella thickened, externally folded over a narrow umbilical chink, internally sharply bent, the upper limb a flat, deeply entering and obliquely ascending plate, the lower swelling into a slight but distinct tubercle. Outer lip internally much thickened, but neither thickened nor reflected externally, forming a sharp angle at the insertion. A thin callus is spread on the body whorl. In the specimen described, the anterior corner of the aperture is externally surrounded by a series of imbricating lamellæ; this may, however, be an individual feature or repair of breakage. Length 26, breadth 12 mill. (*Hedley*).

British New Guinea: the Mambara Goldfield (Coll. Dr. J. C. Cox).

Placostylus remotus Hedley, Proc. Linn. Soc. N.-S. Wales (2), xxiii, p. 97 (May 25, 1898).

"It is the smallest known *Placostylus*, and is remarkable besides for its narrow shape, blunt anterior extremity and peculiar aperture." The single specimen was found by Dr. Cox in the aperture of a large *Rhysota hercules*, in a collection of land shells purchased from a digger returned from New Guinea.

Species of the Solomon Archipelago.

The species of the Solomons fall into three moderately well-characterized groups:

1. *Placocharis*, including ovate, smooth or spirally corrugated species, with plain brown or variegated cuticle, $2\frac{1}{2}$ pitted nepionic whorls, and a moderate or strong columellar fold. Type *P. macgillivrayi*.

2. *Aspastus*, with the shell white, elongated and thin, without noticeable spiral sculpture; $2\frac{1}{2}$ pitted nepionic whorls, the columellar fold very weak, not calloused. Arboreal. Type *P. miltocheilus*.

3. *Eumecostylus*, having the shell much lengthened, the spire slender, with $3\frac{1}{2}$ pitted nepionic whorls, the columella ascending with a long strongly spiral trend. Type *P. cleryi*.

From the phylogenetic point of view, all of these are doubtless more nearly related *inter se* than any of them to forms of other islands; *Aspastus* and *Eumecostylus* being derivatives from the *Placocharis* group, which consists of generalized forms not much modified from the ancient common stock of all the archipelagos. The differentiation of *Aspastus* and *Eumecostylus* has probably been since the period when the islands were united into a single land mass, supposing that to have been once their condition, as the species of these sections are confined to the two southern islands of the group, while the parent stock, *Placocharis*, is spread over the whole archipelago.

All of the species are confined to single islands or their contiguous islets; and as the larger islands are but little known, and some of the smaller wholly unknown malacologically, there will doubtless be many more species of *Placostylus* found in the group. San Christoval Island posesses the most divergent forms, perhaps indicating more prolonged isolation than the other islands.

The distinction between arboreal and terrestrial species is less marked in the Solomon Islands than in New Caledonia.

Key to Species.

A. Surface densely corrugated spirally.

a. With maculate color pattern.

b. Fusiform, $3\frac{1}{2}$ early whorls punctate; yellow with brown or olive maculation, lip more or less red; fold moderate. *sanchristovalensis*, p. 97.

b^1. Oblong, $2\frac{1}{2}$ early whorls punctate; light reddish-brown, with triangular chestnut spots; lip pinkish-brown. *uliginosus* and *hobsoni*, p. 91.

b^2. Oblong, $2\frac{1}{2}$ early whorls punctate; white or yellowish with yellow or brown spots or patches, the aperture and lip pure white; columellar fold and parietal tubercle moderate *hargravesi*, p. 93.

a^1. Yellow or greenish, somewhat streaked with brown.

b. Lip expanded; aperture and lip white; columellar fold strong; a parietal tooth developed; corrugation of the surface rather coarse. *scottii*, p. 90.

b^1. Lip well reflexed; columellar fold weak; spiral sculpture fine. *stutchburyi*, p. 88.

B. Surface not corrugated spirally.

a. White or very pale, thin, openly rimate or umbilicate, the spire slender; columellar fold weak or wanting, no parietal tubercle.

b. Aperture decidedly more than half the length of the shell; surface coarsely plicate, columellar fold often subobsolete. *miltocheilus*, p. 94.

b^1. Aperture about half the total length; surface smooth; columellar fold moderate. *sellersi*, p. 95.

a^1. Reddish or tawny, denuded of cuticle, solid, $3\frac{1}{2}$ early whorls punctate; columella concave with a strong spirally coiled fold, leaving a "false umbilicus" which penetrates to the apex. *clervi*, p. 96.

a^2. Covered with a brown, yellow or olive cuticle; umbilicus narrow or closed; about $2\frac{1}{2}$ early whorls punctate.

b. Outer lip decidedly reflexed, recurved at the edge.

c. Spire decidedly attenuated above; lip white. *strangei*, p. 87.

c^1. Spire conic, not attenuated; lip brown; smoothish. *palmarum*, p. 85.

c^2. Spire conic, stout; surface densely and finely malleate spirally. *stutchburyi*, p. 88.

b^1. Outer lip expanded, or not, hardly reflexed, though often thickened within.

c. Surface with microscopic waved spiral lines, weak but visible in places.

l. Lip narrow, white, not much thickened within, hardly expanded.

e. Slender and long, the columellar fold weak, no parietal tooth.

kreftii, p. 81.

*e*¹. Stouter in figure, with moderate fold and a parietal tooth. *founaki*, p. 79.

*d*¹. Lip wide or moderate, expanded, generally colored or tinted.

e. Shell rather thin, the last whorl inflated; columellar fold and tooth (when present) rather weak.

palmarum var. p. 86.

*e*¹. Solid, oblong, the lip strongly thickened within; columellar fold and parietal tooth strong.

calus, p. 83; *macgillivrayi*, p. 84.

*c*¹. Surface without microscopic crowded and wavy spiral striæ; columellar fold and parietal tooth well developed.

d. Oblong; aperture and lip white.

macfarlandi, p. 83.

*d*¹. Stouter; aperture and lip reddish.

guppyi, p. 82.

Section *Placocharis* Pilsbry, 1900.

Group of P. macgillivrayi.

This is a group of smooth or but faintly malleated species; living on the ground; colors not bright, uniform or with darker streaks, rarely with zigzag or triangular markings.

P. FOUNAKI (Hombron & Jacquinot). Pl. 34, figs. 10–14.

Shell imperforate, oblong-fusiform, rather thin but strong, glossy, dark chestnut or olive with narrow dark streaks and zigzag yellow lines (sometimes wanting); the spire dull red or pallid and whitish; surface beneath the cuticle white. Surface smooth, with slight growth-wrinkles and usually traces of transverse malleation. Spire conic, the apex obtuse, occasionally lost by autotomy. Whorls $5\frac{1}{2}$, the earlier $2\frac{1}{2}$ punctulate, or smooth by erosion, the last convex.

Aperture blue-white within; peristome white, hardly expanded, slightly thickened within, often lightly sinuate above. Columella broadly concave below, passing into a moderate or rather strong fold above; parietal callus thin and translucent, bearing a white tubercle (sometimes obsolete or nearly so) near the columellar fold.

Alt. 69, diam. 30, longest axis of aperture 40 mm.

Alt. 64, diam. 30, longest axis of aperture 39 mm.

Alt. 50, diam. 24, longest axis of aperture $32\frac{1}{2}$ mm.

Ysabel I. (Brazier, Cox, Pease) *and Faro I.* (Guppy), *Solomon group.*

Bulimus founaki H. & J., Voy. au Pol Sud, Zool., Atlas (livr. 23), Moll., pl. 8, f. 13–15 (1842–1853); Rousseau, text of same, p. 32 (1854).—Pfr., Monogr. iii, p. 407 (1853); iv, 467; vi, 85; viii, 122.—E. A. Smith, P. Z. S., 1885, p. 955.—*B. stutchburyi* Pfr., var., Crosse, J. de C., 1864, p. 142.—*Bulimus hombroni* Crosse, Journ. de Conchyl. xix, 1871, p. 178; 1894, p. 171.—*Bulimus paletuvianus* Gassies, Journ. de Conchyl., 1859, p. 370; Conch. Nouv. Caléd., i, p. 48, pl. 2, f. 2.—*B. rhizophorarus* Gassies, Faune Conch. N. Caléd., ii, p. 91 (proposed as a substitute for *B. paletuvianus*); *B. rhizophoraræus* Gassies, index to same vol., p. 204; *B. rhizophorareus* Gassies, Récapitulation, vol. iii, p. 100.—*B. rhizophorarum* Gassies, Journ. de Conchyl., 1878, p. 337 (as Fijian).—*Placostylus founaki* Kobelt, Conchyl. Cab., p. 76, pl. 18, f. 2–6.—*Placostylus macfarlandi* Braz., Kobelt, Conchyl. Cab., p. 33, pl. 8, f. 2, 3, not of Brazier.

Varies considerably in figure, markings, size, and prominence of the parietal tubercle. Sometimes the color-pattern would be better described as triangular spots, more or less confluent into longitudinal streaks, on a greenish-yellow ground. The markings vary from olive-green to reddish-brown. The lip is always white, sometimes slightly cream-tinted, and the interior blue-white.

The species was described from a young but very characteristic specimen (fig. 14). Crosse changed the name to *B. hombroni* because "*founaki*" is not Latin—a trivial reason, which other authors have justly disregarded. According to Gassies, *founak* is a native word for chief.

Var. *paletuvianus* Gassies. Pl. 34, figs. 18, 19.

Similar to the type but wanting zigzag markings, the cuticle being brownish-yellow with some narrow brown streaks. Described as

from the island Nou, New Caledonia, but rejected by Crosse from that fauna. It probably came from the Solomons, though the single specimen before me, probably received from Gassies, is labelled "New Caledonia." It is clearly not *stutchburyi* Pfr., as at one time claimed by Crosse, but only a color-variety of *founaki*.

The name is in allusion to the supposed occurrence of the form among mangroves, from the French name, *palétuviers*, of these shore trees.

P. KREFTII (Cox). Pl. 35, figs. 23, 24, 25.

Shell compressed perforate, oblong fusiform, moderately solid, yellow, streaked and more or less suffused with chestnut, the spire yellowish or reddish. Surface glossy, smoothish, having slight growth-striæ and an excessively minute, close, wavy spiral striation, the earlier $2\frac{1}{2}$ whorls punctate as usual. Spire a little convexly conic, the apex obtuse. Whorls nearly $5\frac{1}{2}$, slightly convex, the last with a very narrow, somewhat plicate white subsutural margination.

Aperture oblong-ovate, whitish within, becoming light brown toward the lip; peristome a little and slowly expanding on the outer and basal margins, white, and very little calloused within; columellar margin broadly dilated and reflexed above, the outer edge passing into the parietal callus, inner margin forming a long spiral fold. Parietal callus milky near the edge, not toothed.

Alt. 58, diam. 24, longest axis of aperture 33 mill.

Alt. 54, diam. 20, longest axis of aperture 29 mill.

Alt. 2.1, diam. 0.92 inch (Cox).

Solomon Islands.

Bulimus (*Charis*)*kreftii* Cox, Proc. Zool. Soc., 1872, p. 19, pl. 4, f. 4.—PFR., Monogr. viii, p. 27.—? *Placostylus kreftii* Cox, KOBELT, Conchyl. Cab., p. 132, pl. 32, f. 4, 5.

P. kreftii has some resemblance to *P. macgillivrayi* in the rich yellowish-chestnut cuticle and microscopic waved striæ. It differs in the white peristome, the gradually widening and bifurcate columella, much less prominently folded, and in wanting a parietal tubercle. Cox's original figure (pl. 35, fig. 23) is a little more ventricose below than the specimens before me in the collection of the Academy (fig. 24) and National Museum (fig. 25).

Kobelt's *P. kreftii* is of doubtful identity, but may be a variety of Cox's species. His comparison with *P. scottii* (p. 133) is due to a

misidentification of the latter; and in translating Cox's English inches into millimeters he makes an error.

P. GUPPYI Smith. Pl. 35, fig. 26.

"Shell rimate, long-ovate, acuminate above, rather solid; rufescent, covered with a brown cuticle which is more or less worn off above; longitudinally wrinkle-striate, sometimes obsoletely malleated on the last whorl. Whorls 5 to 6, rapidly increasing, the earlier 3 rather flattened or slightly convex, the penultimate a little convex, the last whorl more convex, large, oblong, submarginate and lightly corrugate-plicate below the oblique suture.

"Aperture inversely ear-shaped, exceeding half the total length of the shell, pale reddish within, becoming darker towards the lip; peristome thickened, slightly expanded, reddish, the margins joined by a thin whitish parietal callous; columellar margin broadly expanded in the umbilical region, forming a strong white fold in the aperture, which is armed with a prominent white tubercle above the columellar fold. Length 80, diam. 37, aperture 40 mill. long inside, 19 wide" (*Smith*).

Solomon Is. (Brazier).

Placostylus guppyi E. A. SMITH, P. Z. S., 1891, p. 489, pl. 40, f. 6.

"The species does not compare closely with any other form. It is rather ventricose, but less so than *P. eddystonensis*, but in other respects it is quite different. The epidermis is of a rich brown color, here and there striped with a darker tint. The columellar fold and the tubercle above are strongly developed. I have named this interesting species after Dr. H. B. Guppy, who has considerably advanced our knowledge of the fauna of the Solomon Islands" (Smith).

I have seen a single specimen referable to this species. It agrees well with Smith's description and figure, except that the strong internal thickening of the outer lip is whitish and extends only about two-thirds up the lip, the upper third being conspicuously thinner, and the free edge of the columellar fold is rather thin, sharp, and bent outward, making a sort of flange. It measures 79 mill. long, 38 wide, and the length of the aperture with peristome is 44 mill. There remain less than 5 whorls, the apex being amputated and plugged. This specimen was received from Dr. J. C. Cox with the locality Solomon Is.

P. MACFARLANDI (Brazier). Pl. 35, figs. 21, 22.

Shell perforate, oblong-fusiform, moderately solid; tawny-yellow with many narrow chestnut streaks, or sometimes of an olivaceous-brown tone; the suture usually bordered by a white line, spire dull red, the apex self-amputated. Surface somewhat glossy, with slight growth-wrinkles and a variable amount of coarse spiral malleation. Whorls remaining about 5, slightly convex, the last oblong.

Aperture white throughout; peristome *white* or slightly brown-tinted at the outer edge, the outer lip somewhat sinuous, slowly expanded below the middle, not reflexed, thickened within, the thickening heavier at and below the middle. Columella suddenly dilating at its junction with the body, produced inward in *a very strong, rounded, white, callous fold;* parietal wall *covered with a strong white callus*, which bears an oblong tubercle near the columellar fold.

Length 76, diam. 31, longest axis of aperture 42½ mill., whorls 5.

Length 72, diam. 29, longest axis of aperture 40 mill., whorls 4½.

Solomon Islands (Capt. Macfarland).

Bulimus (*Eumecostylus*) *macfarlandi* BRAZIER, Proc. Linn. Soc. N. S. Wales, i, p. 4 (1875).—*B. macfarlandi* Braz., PFR., Monogr., viii, p. 604.—COX, P. L. S. N. S. Wales (2), ii, p. 1063, pl. 21, f. 7 (1888).—*B. macfarlanei* COX, PAETEL, Catal., p. 98.—*Placostylus macfarlandi* Braz., KOBELT, Conchyl. Cab., p. 67, pl. 16, f. 3, 4. Not *P. macfarlandi* Braz., KOBELT, t. c., p. 33, pl. 8, f. 2, 3.

Somewhat allied to *P. macgillivrayi*, which it resembles in the thickened, not reflexed lip, and strong folds, but distinct by its larger size, wholly white aperture and some details of form. Moreover, *P. macfarlandi* lacks the microscopic spiral striolation of the other species. It is named for Captain Macfarland who collected the original specimens, but of whom nothing else is known to me.

Three specimens seen, as well as those figured by Cox and Kobelt, are amputated at the apex. I have seen specimens bearing the MS. name *B. brodiei* Braz.

P. CALUS Smith. Pl. 35, fig. 20.

Shell elongate, perforate, reddish above, the last whorl paler, covered with a thin yellowish-olivaceous cuticle; striated with delicate growth lines, and under the lens seen to be microscopically and irregularly striate transversely. Whorls 6, rapidly increasing, the

upper but little convex, the last elongate, large, very obliquely descending, peculiarly swollen or gibbous at the left side.

Aperture long, inversely ear-shaped, about three-fifths the length of the shell, dirty white within, becoming reddish or brownish towards the lip, provided with a strong white parietal tooth; columellar fold very prominent, white; lip expanded, subreflexed, fleshy-reddish, the margins joined by a thin parietal callus; columellar margin much reflexed, half covering the umbilicus.

Length 78, diam. 33, length of aperture inside 44, width 14½ mill. (*Smith*). *Solomon Is.*

Placostylus calus E. A. Smith, P. Z. S., 1891, p. 489, pl. 40, f. 7.

This species is about the size and general form of *Pl. macfarlandi* of Brazier, but differs in having the body-whorl a little longer in proportion to the spire, and the aperture is also more elongate, and the peristome is fleshy red and more expanded. It is more elongated than *Pl. macgillivrayi* Pfr., and has a less acuminate spire, but it agrees with it in the character of the columellar fold and the tubercle above it on the body-whorl (*Smith*).

P. macgillivrayi (Pfeiffer). Pl. 36, figs. 27, 28, 29, 30.

Shell compressed-umbilicate, oblong-fusiform, rather solid and and strong, tawny-brown, with narrow darker streaks, becoming pink or flesh-tinted on the spire (sometimes pale yellow with olive streaks, the spire flesh tinted); suture bordered with a white or pink band. Surface glossy, sculptured with slight growth-wrinkles, and under a strong lens showing *crowded, very fine and waved spiral striæ*, very superficial and sometimes lost by erosion or cleaning. Spire conic, rather stout, the apex obtuse. Whorls 5 to 5½, slightly convex, the last not ascending in front, somewhat compressed and perceptibly cylindrical. 2½ early whorls punctate.

Aperture flesh-colored within, deepening to a livid reddish toward the lip (but nearly white in yellow specimens); *peristome thick, flesh-colored or brownish-pink, somewhat expanded but not reflexed, strongly thickened within* on the outer, basal and columellar margins, the thickening reduced toward the posterior termination of the lip, forming a wide, shallow posterior sinus. Columella broadly reflexed above, folded, *the fold bearing a very strong white callus*, which is curved outward forming a rounded channel along the root of the columella. Parietal callus thin and transparent, *bearing a strong, erect, oblong,*

obliquely entering nodule near the columellar fold, and separated from it by a deep and rather narrow sinus.

Alt. 57, diam. 23, longest axis of aperture 33 mill.

Alt. 51, diam. 21, longest axis of aperture 27 mill.

Alt. 45, diam. 20, longest axis of aperture 26 mill.

Wanderer's Bay, Guadelcanar I., Solomon group (Macgillivray).

Bulimus macgillivrayi PFR., P. Z. S., 1855, p. 108, pl. 32, f. 2; Monogr. iv, p. 379.—CROSSE, J. de C., 1864, p. 134.—*Placostylus macgillivrayi* Pfr., KOBELT, Conchyl. Cab., p. 72, pl. 17, f. 4, 5 (not characteristic).

The strong development of the columellar and parietal folds, the decided callous rib widening the merely expanded lip, and excavated above in characteristic Placostyline manner, are the more striking features of this species, the microscopic sculpture being a further character of value, though shared with some other forms. The nude white or pink band below the suture is occasionally indistinct through partial loss of the cuticle on the rest of the shell. One of the specimens before me is white under a pale yellow cuticle (fig. 28) and the spire is short. The aperture, however, is typically developed.

Pfeiffer's type (fig. 30) measures 59 mill. long, and is figured as being more conspicuously streaked than the specimens I have seen, but the figure may be exaggerated.

Named in honor of John Macgillivray, naturalist of H. M. S. "Rattlesnake," which surveyed portions of the Louisiades and Torres Straits, 1846–1850.

P. PALMARUM (Mousson). Pl. 36, figs. 31, 32.

Shell rimate-perforate, ovate-oblong, somewhat solid, striate, with a few slight spiral wrinkles; shining, chestnut-brown. Spire high-conic, regular, the apex worn, suture irregular, somewhat crenulated, broadly white-margined. Whorls $4\frac{1}{2}$, regularly increasing, the nuclear punctate, the rest moderately convex, last whorl a little ascending, as long as or longer than the spire, somewhat tapering basally.

Aperture vertical, oval, gray-brownish inside, provided with an oblique, oblong, parietal tubercle; peristome brown, thickened, evenly reflexed, slightly thickened within; the right margin arcuate above, nearly straight and more thickened in the middle; basal

margin arcuate, columellar margin dilated. Columella thickened, white, obliquely folded. Alt. 60, diam. 25 mill. (*Mouss.*).

Makito, San Christoval I., Solomon group, on palms (Rietman).

Bulimus palmarum Mouss., Journ. de Conchyl., 1869, p. 62, pl. 4, f. 5.—Pfr., Monogr., viii, p. 28.—*Placostylus palmarum* Mouss., Kobelt, Conchyl. Cab., p. 41, and var. *minor*, p. 42, pl. 9, f. 6–9.

P. palmarum differs from *P. macgillivrayi* in having the lip strongly reflexed, less thickened within, and in the less developed parietal and columellar folds. It may prove to be a variety of that species. The var. *minor* of Kobelt differs from *palmarum* chiefly in the narrower lip, and might as properly, perhaps, be referred to *P. macgillivrayi*.

Var. minor Kobelt. Pl. 36, figs. 33, 34.

The shell varies from greenish-yellow with olive streaks to a tawny yellow with chestnut streaks, the spire fleshy or red, in one shell white; a light subsutural band in all. The sculpture consists of growth-wrinkles and an excessively fine, dense spiral striation, obsolete in places, and some very shallow spiral sulci, rather inconspicuous. Whorls fully $5\frac{1}{2}$, the first often amputated; the suture not rising at its termination. Aperture bluish-white or livid within, becoming yellowish or brownish within the lip; peristome flesh-colored or fleshy-brown (in one shell white), the outer lip hardly expanded above, becoming well expanded below, or even narrowly reflexed. Columella brown, with a white callus superposed on the fold; parietal callus a mere transparent film, in adults usually bearing a small, low white tubercle above the columellar fold.

Length 50, diam. 23, longest axis of aperture 29 mill.

Length 45, diam. 21, longest axis of aperture 25 mill.

Besides its smaller size and paler color, this form differs from typical *palmarum* in the decidedly less reflexed peristome. It differs from *P. macgillivrayi* in being thinner, without the callous thickening of lip and columella so pronounced in that species. I have seen over twenty specimens in the collections of the Academy, the National Museum and Mr. John Ford, showing it to be reasonably constant.

Mr. Hedley informs me that Brazier regards it as a dwarf *macgillivrayi*, and gives the locality Savu, Solomon group.

P. STRANGEI (Pfeiffer). Pl. 34, figs. 15, 16, 17.

Shell compressed-umbilicate, fusiform-oblong, thin, varying from straw yellow or paler to a somewhat tawny yellow with numerous inconspicuous darker streaks, the suture bordered below by a white band; spire paler, sometimes pink-tinted. Surface glossy, sculptured with growth-wrinkles which sometimes become thread-like, and obsoletely decussated with a very shallow spiral malleation. *Spire slender*, with slightly concave outlines, the apex very obtuse, often amputated; earlier $2\frac{1}{2}$ whorls punctate, the last suture rising a little at its termination. Whorls 5 to $5\frac{1}{2}$, slightly convex, the last swollen.

Aperture slightly oblique, white or yellowish within, *becoming tinted with egg-yolk yellow toward the outer lip* in adult shells; *peristome white, reflexed and recurved at the edge* throughout; columellar margin broadly dilated above. Columella passing into a long fold above, this fold bearing a moderate callus on or near its convex edge; parietal callus thin and transparent, in most fully adult shells bearing a small tubercle near the columellar fold.

Alt. 43, diam. $19\frac{1}{2}$, longest axis of aperture 26 mill.

Alt. 48, diam. 23, longest axis of aperture 28 mill.

Alt. 52, diam. 22, longest axis of aperture 29 mill.

Eddystone (or Narovo) *Island*, *Solomon group*.

Bulimus strangei PFR., P. Z. S., 1855, p. 8; Novit. Conch. i, p. 54, pl. 16, f. 11, 12; Malak. Bl. 1855, p. 148; Monogr. iv, p. 378; vi, p. 23; viii, 28.—CROSSE, Journ. de Conchyl., 1864, p. 135.—*Placostylus strangei* FFLD., Verh. Zool.-Bot. Ges. Wien, xix, 1869, p. 874.—TAPPARONE-CANEFRI, Malac. Viaggio della R. Fregata "Magenta," p. 86, pl. 2, f. 11.—KOBELT, Conchyl. Cab. p. 23, pl. 5, f. 4, 5, 6.

The obvious differential character of this species is its noticeably more slender spire than that of allied species, the more lengthened examples recalling *P. sellersi* in this respect. Pfeiffer's type was a rather small form, length 46 mill., which had not developed the parietal tubercle, the epidermis being somewhat tawny. The tubercle varies a good deal in size, and is added only after the adult aperture is otherwise completely formed.

In *P. stutchburyi* the spire is shorter and stouter, the aperture larger, and the spiral malleation much more pronounced. In *P. macgillivrayi* the lip is not reflexed and recurved, but is decidedly thickened within, the columellar and parietal projections are stronger, and the mouth is reddish.

The species is named for a naturalist who contributed shells to Cuming's collection.

Eddystone, Simbo or Narovo Island is a small volcanic islet, about four miles long, and lying west of the north end of New Georgia.

P. STUTCHBURYI (Pfeiffer). Pl. 36, figs. 35, 36, 37.

Shell subumbilicate, ovate fusiform, rather thin, striate, slightly decussated by very fine spiral striæ, shining, tawny, with radiating darker [longitudinal] lines. Spire almost regularly conic, somewhat obtuse; suture white edged. Whorls 5, a little convex, the last three-fifths the length of shell, shortly and arcuately ascending in front, tapering at the base.

Aperture reversed ear-shaped, acute above, usually with a parietal nodular tubercle, pearly within; columella white, moderately folded; peristome of a flesh-tawny color or white, the right margin almost regularly arcuate, expanded and reflexed, the columellar margin dilated, flat, nearly adnate. Length 53, diam. [25], length of aperture inside 30 mill. (*Pfr.*).

New Georgia, Solomon Is. (Brazier).

Bulimus stutchburyi PFR., P. Z. S., 1860, p. 137, pl. 51, f. 8; Malak. Bl. 1861, p. 12; Monogr. vi, p. 23; viii, 27.—CROSSE, J. de C., 1864, p. 142 (first reference only, exclusive of synomymy and remarks).—*Placostylus stutchburyi* Pfr., KOBELT, Conchyl. Cab. p. 135, pl. 32, f. 8 (copy from Pfeiffer).

Pfeiffer's description is translated above, and his figure copied on pl. 36, fig. 35. The specimens before me are somewhat smaller than the type:

Alt. 48½, diam. 22½, longest axis of aperture with peristome 29½ mill.

Alt. 46½, diam. 22½, longest axis of aperture with peristome 30 mill.

Alt. 52, diam. 24, longest axis of aperture with peristome 30 mill.

Alt. 50, diam. 22, longest axis of aperture with peristome 30 mill.

The lip is white or faintly brown-tinted. In one old specimen (fig. 36) the lip is thickened within, much as in *P. macgillivrayi*, but there is no such callous on the columella as in that species. Three out of five specimens have a small nodule on the parietal wall above the columellar fold. 2½ or 2⅔ nepionic whorls have the usual pitted sculpture, and in some the first whorl has been self-amputated. The sculpture is a combination of moderate growth wrinkles or some-

times fine riblets on the middle and base of last whorl, with a very fine malleation across them, produced by close, shallow, spiral depressions; these impressions sometimes obvious, sometimes reduced to mere shallow depressions between growth-striæ. It is of the nature of the sculpture of *P. elobatus*, etc., but on a very small and superficial scale, and is not like that of *P. macgillivrayi* or *palmarum*.

With the well-reflexed and slightly recurved lip of *P. strangei*, this species has another sculpture and a stouter spire. Fig. 36 is No. 159494 U. S. Nat. Mus.; fig. 37 is 4667 of the Academy collection.

The localities "Erumanga, New Hebrides," and "New Caledonia," formerly given by Pfeiffer, are incorrect. It is evidently a Solomon Island species, the locality "New Georgia" being on Brazier's authority.

In my opinion the shells described by Kobelt as *P.* (*scottii*, var.) *mendanæ* belong to *stutchburyi*. It should be noted that Kobelt had specimens of neither *scottii* nor *stutchburyi* for comparison, and might thus readily think his form a new one. The original description follows:

Var. MENDANÆ Kobelt. Pl. 37, figs. 40, 41.

Shell rimate, ovate-conic, rather solid, roughly striate-costate, and made granose or decussated by transverse wavy striæ; yellowish-brown with darker streaks, the apex paler. Spire conic, apex obtuse, beautifully granulate. Whorls 6, convex, separated by an impressed, crenulated, slightly whitish-margined suture, the last whorl large, rather inflated, double the length of the spire, descending, a trifle ascending in front. Aperture large, ovate-acuminate, dilated at base, the throat whitish-brown; peristome white, slightly thickened, moderately expanded, the margins joined by a very thin callus, outer lip very slightly sinuous above, then produced; columellar margin dilated, bearing a strong, compressed, white entering fold. Alt. 52, diam. 26, alt. of aperture 32 mill. (*Kobelt*).

Solomon Is.

Placostylus (*scottii* Cox var.) *mendanæ* KOBELT, Conchyl. Cab., *Placostylus*, p. 133, pl. 32, f. 6, 7 (1891).

Described from two specimens, one in coll. Dohrn, the other in the Berlin Museum. Named for Mendana, the discoverer of the Solomon Islands.

P. (?) COXI (Pease).

Shell thick, ovate, perforate, dextral, longitudinally roughened with growth striæ, whitish suffused with roseate, the spire yellowish. Whorls 4, somewhat swollen, the last three-fifths the total length of the shell. Spire short, somewhat obtuse, the suture well impressed. Aperture vertical, oval, reddish inside; peristome pale orange, thick, the margins joined by a callus, the columellar margin nearly closing the perforation. Length 25, diam. 15 mill. (*Pse.*).

Solomon Islands (Cox).

Bulimus (*? Borus*) *coxi* PEASE, Amer. Journ. of Conch. vii, p. 197 (1871).

"The above, in shape and general proportions, as well as in color, is a miniature *B. rosaceus* (King). The last whorl is whitish, suffused with rose color, spire yellowish, aperture reddish, and margin of the peristome light orange color. Its surface is not granulose, but roughened by incremental striæ. I attach to this species the name of Dr. J. C. Cox, through whose active researches, during the past few years, we are indebted for an extended knowledge of the molluscous fauna of the Australian and Papuan provinces." (*Pease.*)

Known by the above description only. The type is not in the Pease collection at Cambridge (Mus. Comp. Zool.), and it has not been figured. Seems to resemble *P. ochrostoma* Garrett, somewhat.

Group of P. scotti.

Shell distinctly wrinkled spirally.

P. SCOTTII (Cox). Pl. 37, figs. 38, 39.

Shell perforate, oblong-fusiform, moderately solid, of a slightly greenish-yellow, with narrow olivaceous or olive-brown streaks, suture narrowly white-margined, the spire white above. Surface glossy, having growth-wrinkles, and covered with a *rather coarse obliquely spiral corrugation* of anastomosing wrinkles (fig. 39); the earlier $2\frac{1}{2}$ whorls punctate as usual. Spire conic, rather slender, the apex obtuse, whorls slightly exceeding 5, somewhat convex, the last long-oval.

Aperture white throughout, ovate; *peristome white*, the outer lip blunt, becoming expanded below, moderately thickened within. Columella suddenly dilated above, forked, the inner edge forming a *strongly convex fold*, the edge of which is somewhat curved outward;

parietal wall bearing a white callus, translucent in the middle, and provided with an oblong tubercle above the columellar fold.

Length 52, diam. 23, longest axis of aperture 30 mill.

"Length 2.1, diam. 1, length of aperture 1.18 inch." (Cox) = 52½, 25, 29½ mill. *Solomon Is.*

Bulimus (*Eumecostylus*) *scottii* Cox, P. Z. S., 1873, p. 152.—Pfr., Monogr., viii, p. 28.

The figure and description are from a specimen received from Dr. Cox, which, except in being two mill. narrower than the dimensions assigned to the type, agrees excellently with Cox's description. Kobelt's *P.* (*scottii* Cox. var.) *mendanæ* evidently has nothing to do with this species.

P. scottii is not remote from *P. hargravesi*, but the columellar fold is stronger, the whorls less convex, and the cuticle not figured, being merely streaked.

P. uliginosus 'Heimb.' Kobelt. Pl. 37, figs. 46, 47.

Shell covered-perforate, long-ovate, rather thin but solid, irregularly and quite rudely striate, sculptured with fine, confluent, transverse wrinkles; covered with an adherent buff-brown glossy cuticle, ornamented with very distinct streaks and flames of chestnut. Spire conic, buff, the apex rather obtuse. Whorls 5 to 6, a little convex, separated by a distinct though scarcely impressed suture, the last whorl large, a little inflated, occupying two-thirds the length of the shell, almost lirate at the base, flattened behind the aperture, neither descending nor ascending in front. Aperture slightly oblique, ovate-acuminate, brownish-white within; peristome unexpanded or very narrowly reflexed, white-lipped within, the margins hardly united; outer margin but slightly arcuate, basal margin spreading, columellar margin dilated, reflexed, provided with a compressed entering white fold, the parietal wall of the aperture sometimes having a small whitish tooth, sometimes toothless. Alt. 50, diam. 23, alt. aperture 29 mill. (*Kobelt*). *Solomon Is.*

Placostylus uliginosus von Heimburg, Kobelt, Conchyl. Cab., *Placostylus*, p. 73, pl. 17, f. 6, 7 (1891).

The following form is probably identical with or a variety of *P. uliginosus*:

P. hobsoni (Cox). Pl. 37, figs. 44, 45.

"Shell deeply and openly rimate, comparatively thin and light for

its size, translucent, the sculpture and markings are very visible on the body whorl through the wall of the shell by transmitted light; shining and lustrous, of a light reddish-brown color, the whorls of the spire becoming lighter in shade and more of a pinkish-brown; ornamented with many irregularly-sized and irregularly-distributed chestnut-colored tentoriform markings; whorls slightly inflated, causing the suture to assume an impressed character. Suture margined by a narrow, opaque, slightly raised, knotted, selvaged margin (not smooth and straight as represented in the figures); whorls longitudinally irregularly marked with lines of growth and transversely subcostately ridged with rather coarse raised undulating lines, which frequently anastomose (a character quite omitted in the figures, but which is very characteristic), becoming much less distinct on the whorls beyond the body whorl, till, on the third whorl from it, they are almost invisible, and are gradually replaced by a granular punctation, which increases in distinctness quite to the apex; these granular punctures are disposed in two distinct transverse slanting rows, one running from right to left, the other from left to right. Aperture oblong-ovate, of a pinkish-brown color; peristome only slightly thickened and everted, pinkish-brown throughout, except at the columella which is of an opaque white only very faintly tinted with pink-brown; columella broadly expanded and dividing at its insertion, as in all the shells of this group, into two processes, the outer and smallest gradually blending with a thin transparent glassy callus, which runs towards the insertion of the upper end of the peristome, which is rather arched out from the side of the shell as it leaves its insertion (more so than is represented in the figure), the larger process of the divided columella enters spirally the interior of the shell. In the several specimens of this species which I have seen, there is no disposition to the formation of a callosity or tooth on the body whorl in the aperture between the inserted ends of the peristome. Length 58, breadth 27 mill." (*Cox.*)

Maleita Island, Solomon Archipelago (Hobson).

Bulimus (*Placostylus*) *hobsoni* Cox, Proc. Linn. Soc. New South Wales (Series 2), vi, pt. 3, p. 567, pl. 20, f. 2, 3 (May 23, 1892).

Allied to *P. scottii* Cox, but differing in being marked with triangular spots, and in the less strong columellar fold.

The figures of this form published by Dr. Cox are defective according to him in not showing the sculpture nor margination of the

sutures and in representing the outer lip as less arcuate towards its upper insertion than it really is; but as I have no specimens, these figures are reproduced on my plate. The type is in Dr. Cox's collection.

P. HARGRAVESI (Cox). Pl. 38, figs. 49, 50, 51.

Shell compressed-umbilicate, oblong-fusiform, thin but moderately solid; white under a thin yellowish cuticle, spotted with triangular, oblong and irregular spots and dots of chestnut or olivaceous yellow-brown; the markings disappearing on the spire which is more or less rose or yellow tinted. Surface slightly shining or dull, densely corrugated spirally, the wrinkles anastomosing, less pronounced than in *P. sanchristovalensis*, subobsolete on the spire, the earlier $2\frac{1}{2}$ whorls of which are punctate. Spire conic, apex obtuse. Whorls nearly $5\frac{1}{2}$, quite convex.

Aperture white throughout, long-ovate; *peristome white*, reflexed and recurved, the outer lip thickened a little within; columella dilated above, passing into a convex, spirally entering fold; parietal callus transparent, bearing a strong callus nodule near the columellar fold.

Length 62, diam. 27, longest axis of aperture 35 mill.

Length 55, diam. 25, longest axis of aperture $31\frac{1}{2}$ mill.

Treasury Island, Solomon group.

Bulimus hargravesi Cox, P. Z. S., 1871, p. 323, pl. 34, f. 3.—Pfr., Monogr. viii, p. 43.—*Placostylus hargravesi* KOBELT, Conchyl. Cab., p. 38, pl. 9, f. 2, 3, and var. *heimburgi*, p. 38, pl. 8, f. 6, 7 (1891).

The color-pattern of *P. hargravesi* reminds one of *P. malleatus* of the Viti Is. The whorls are much more convex than in *P. sanchristovalensis*, the nepionic shell is smaller, the lip wider, and a parietal tooth is well developed. The color-scheme varies a good deal, but is much less intense than in *P. sanchristovalensis*, and the aperture is white. Figs. 50, 51 are from a specimen in the collection of the Academy; fig. 49 from one in the National Museum, no. 159493.

Var. *heimburgi* Kobelt. Frontispiece, fig. 5.

Shell much smaller, more slender, rose-white with buff-brown streaks, cuticle almost absent. Alt. 47, diam. 21, length of aperture 27 mill (*Kobelt*).

Section *Aspastus* Albers, 1850.

White, arboreal species of long contour, without spiral sculpture, inhabiting the southern two islands of the Solomon group.

P. MILTOCHEILUS (Reeve). Pl. 38, figs. 53, 54.

Shell compressed-umbilicate, fusiform, thin, *white*, covered with a thin pale lemon-yellow cuticle which is generally wholly lost in adult shells. Surface glossy when unworn, strongly and *coarsely plicate* lengthwise, the spire and base nearly smooth. Spire long and slender, the apex obtuse. Whorl $5\frac{1}{2}$ (or in small forms 5), but slightly convex, the last oblong, *swollen or gibbous, somewhat sack-like, at the base.* Aperture fusiform, white within, *the peristome vermilion* narrowly reflexed, scarcely thickened within; parietal callus, thin and transparent, pale yellow from the underlying cuticle; columella dilated, with a weak fold above.

Alt. 68, diam. 25, longest axis of aperture 40 mill.

Alt. 53, diam. 20, longest axis of aperture 30 mill.

San Christoval, Solomon Is., at *Port Makera, Wanga Bay, Recherche Bay* and *Port Achard*, on the leaves of bushes and trees (Brazier), southeast part of San Christoval (Guppy); varieties on *Ugi* or Gulf Island, Sesarga, Ulana or *Contrariété Island*, and *Santa Anna Island.*

Bulimus miltocheilus REEVE, Conch. Icon., pl. 49, f. 322 (November, 1848).—PFR., Zeitsch. f. Malak., 1848, p. 120; Monogr., iii, p. 371; iv, 440; vi, 77; viii, 108; Conchyl. Cab., p. 147, pl. 45, f. 18, 19.—DESHAYES, in Fér. Hist., ii, p. 105, pl. 154, f. 3, 4.—PHILIPPI, Abbild. u. Beschreib., iii, p. 98, *Bul.*, pl. 9, f. 7.—CROSSE, Journ. de Conchyl., 1864, p. 148.—BRAZIER, P. Z. S., 1869, p. 162.—*Otostomus miltocheilus* ADAMS, Gen. Rec. Moll., ii, p. 151.—*Aspastus miltocheilus* CHENU, Man. de Conch., p. 437, fig. 3216.—*Bulimus* (*Placostylus*) *miltocheilus* E. A. SMITH, P. Z. S., 1885, p. 595.—*B.* (*Aspastus*) *miltocheilus* BRAZIER, Proc. Linn. Soc. New South Wales (Ser. 2), ix, p. 569, with varieties *stramineus* (p. 569), *minor*, *albolabris* (p. 570).—*Placostylus miltocheilus* KOBELT, Conchyl. Cab., p. 63, pl. 15, f. 2–5.

A beautiful species, arboreal in habits. The mantle is said to be green, giving the living mollusk the appearance of a lanceolate leaf. The typical form (figs. 53, 54) is denuded of the very thin cuticle in adults, and the base is more or less markedly sack-like.

Var. *stramineus* Brazier (pl. 38, fig. 55). A pale straw-yellow cuticle retained in adults; shell rather short and less sack-like below, with 5 whorls; peristome very dark red, the columellar fold usually yellow.

Ugi (Gulf or Golfe) *Island*, close to S. Christoval to the northward, on the trunks of palms, four or five feet from the ground (Brazier).

Var. *minor* Brazier. Shell small, narrow, white; peristome pale orange-yellow. Length 45 mill (*Braz.*).

Ulana (Ulaua or Contrariété) *Island*, north of S. Christoval, on palm trunks (Brazier).

Ulana Island is some distance from San Christoval, but closely allied to it faunally, and probably was connected therewith later than with any other islands. The other islets inhabited by varieties of this species are immediate dependents of the larger island.

Var. *albolabris* Brazier (pl. 38, fig. 52). White with a very pale yellow cuticle; peristome opaque white; form rather short, and base less sack-like than in the type. Length 55 mill. Specimen figured measures length 50, diam. 23, length of aperture 33 mill.

San Christoval and Santa Anna I. (or U-ah I., close to the S.-E. end of S. Christoval), on trunks and leaves of trees (Guppy, Brazier).

According to Brazier, only the var. *albolabris* is found on Santa Anna, a small island at the south end of San Christoval. It is very common there.

P. SELLERSI (Cox). Pl. 38, figs. 56, 57.

Shell compressed-umbilicate, fusiform, thin but moderately solid; *white*, the lip, apex and sutural border opaque white, the rest of the shell somewhat grayish-white; surface shining, smooth except for slight growth lines. *Spire slender*, with slightly concave outlines, the apex obtuse. Whorls $5\frac{1}{2}$, but slightly convex, the earlier $2\frac{1}{2}$ forming a long punctate nepionic shell; last whorl rather inflated at the base.

Aperture ovate, *white;* peristome expanded, thickened within except at the upper third, white. Columella dilated above, with a moderately convex fold; parietal callus white, toothless.

Length $44\frac{1}{2}$, diam. 18, longest axis of aperture $23\frac{1}{2}$ mill.

"Length 1.9, breadth 0.66 inch" (Cox).

Gaudalcanar Island, Solomon Archipelago.

Bulimus sellersi Cox, P. Z. S., 1871, p. 644, pl. 52, f. 3.—Pfr., Monogr. viii, p. 31.—*Placostylus sellersi* Cox, Kobelt, Conchyl. Cab., p. 55, pl. 13, f. 6, 7.

An isolated species, resembling *P. miltocheilus* in color, the ample umbilical rimation and slender spire, but with the lower two-thirds of the outer lip more or less thickened within, and having a stronger columellar fold. Fig. 57 is copied from Dr. Cox's type figure.

Section *Eumecostylus* Albers, 1860.

Much elongated, with $3\frac{1}{2}$ early whorls pitted; lip a little reflexed; columella curved in a long spiral fold.

Other Solomon species have but $2\frac{1}{2}$ pitted nepionic whorls, and a somewhat differently formed columella. Both of the species are confined to San Christoval, the most southern island of the group.

P. cleryi (Recluz). Pl. 40, figs. 68, 69, 70.

Shell minutely rimate, oblong-fusiform, more or less compressed laterally and cylindrical, rather solid. Pink or flesh-colored, becoming purplish-red on the spire and destitute of cuticle throughout; the surface lusterless, sculptured with low, coarse growth-wrinkles and an inconspicuous fine spiral malleation. Whorls $6\frac{1}{2}$, the first often amputated and plugged, the earlier $3\frac{1}{2}$ densely pitted, the last one or two whorls more rapidly descending. Aperture auriform, somewhat effuse or retracted below; outer lip hardly expanded, somewhat thickened within; basal lip broadly arcuate, somewhat expanded; columella broadly concave below, curving in a strong spirally entering fold (often obscurely bifid) above; parietal wall covered with a thin callus, sometimes bearing a small tubercle far within and near the columellar fold (fig. 69).

Alt. 100, diam. 35, longest axis of aperture 58 mill.

Alt. 103, diam. 30, longest axis of aperture 50 mill.

San Christoval, Solomon group, at Makira Harbor (Macgillivray) *and the Koofeh district on the north coast* (Guppy).

Bulimus cleryi Petit, Journ. de Conchyl., 1850, p. 56, pl. 4, f. 1. —Pfr., Conchyl. Cab., p. 243, pl. 65, f. 3; Monogr., iii, p. 306; iv, 369; vi, 13; viii, 27.—Crosse, Journ. de Conchyl., 1864, p. 133. —E. A. Smith, P. Z. S., 1885, p. 594.—*Placostylus cleryi* Kobelt, Conchyl. Cab., p. 57, pl. 15, f. 1; pl. 14, f. 1.

This large and very distinct species somewhat resembles, but is

not allied to *P. seemanni* in the Viti group. It varies remarkably in contour, as Mr. Smith has noted, and is sometimes greatly lengthened, a specimen taken by Mr. Guppy measuring 104 mill. long, 29 wide, while that shown in fig. 70 is almost as long. The other ordinary variation is illustrated in fig. 69, the shell being shouldered and constricted. The type (fig. 68) was a regularly oblong shell. The callus of the outer lip is more or less excavated above, as usual in the genus. Pfeiffer states that young shells have a green epidermis, but this is wholly lost in adults.

The species is named for M. Hanet-Clery, who collected the first specimens.

P. SANCHRISTOVALENSIS (Cox). Pl. 37, fig. 48.

Shell perforate, fusiform, thin but moderately strong; *yellow or olive-yellow*, *spotted with irregular longitudinal blotches*, sometimes triangular, and small oval spots of blackish-brown, becoming more diluted, dusky-olive, on the latter half of the last whorl, or sometimes the spots are rather large and pale olive or olive-brown throughout; the spire roseate. *Surface glossy*, *densely corrugated spirally*, the wrinkles occasionally confluent, this sculpture fainter on the penult. whorl; the earlier $3\frac{1}{2}$ whorls densely punctate. Spire slender, elongate, the apex obtuse. Whorls $5\frac{1}{2}$ to 6, but slightly convex, the last oblong. Aperture long-ovate, white within; *peristome broadly bordered with red-orange*, narrowly or rather widely reflexed, hardly thickened within. Columella expanded and forked at the insertion, produced in a long spiral fold; parietal callus thin and transparent.

Alt. 66, diam. 26, longest axis of aperture $36\frac{1}{2}$ mill.

Alt. 63, diam. 25, longest axis of aperture $36\frac{1}{2}$ mill.

Alt. 71, diam. 29, longest axis of aperture $38\frac{1}{2}$ mill.

San Christoval, *Solomon Group*.

Bulimus san-christovalensis Cox, P. Z. S. 1870, p. 172, pl. 16, f. 7.—Pfr., Monogr. viii, p. 27.—*Placostylus sanchristovalensis* Kobelt, Conchyl. Cab., p. 34, pl. 8, f. 4, 5.

A charming snail, somewhat like *P. hargravesi* in pattern, but more brilliantly colored, more strongly sculptured, and differing in form. Moreover, this species has $3\frac{1}{2}$ nepionic whorls, while *P. hargravesi* is like the majority of the Solomon Island species in having but $2\frac{1}{2}$. Viewed from the base, the spiral trend of the columella

leaves a "false-umbilicus" penetrating the axis. Dr. Cox states that some specimens have a parietal tooth, and his figure shows a prominence within the middle of the outer lip, evidently abnormal, as it is not alluded to in his description, and is wanting in the specimens before me. These show some variation in the blotches, which may be either rather intense and defined, or paler, larger and less definite at the edges. Moreover, the pink of the spire and lip is sometimes diluted to a flesh tint. It is undoubtedly allied to *P. cleryi*.

Species of the Viti or Fiji Archipelago.

The species of this group of islands are allied rather to those of the Solomons than to New Caledonian forms. They are a coherent group of doubtless common ancestry, though the differentiation into dull terrestrial and more brilliant arboreal forms masks the similarity to some extent. Hedley adduces considerable evidence of the alliance of the Fiji and Solomon faunas (Proc. Linn. Soc. N. S. Wales (2), vii, p. 339; xxiii, 1898, p. 99). "Recent soundings have developed a plateau of a depth not greater than 1,500 fathoms in a general depth of from 2,000 to 3,000 fathoms, including Tonga and Fiji, and extending westward to Santa Cruz and Solomons."

Our knowledge of Fiji land snails is chiefly due to the well-directed energy of the renowned South Sea naturalist Andrew Garrett, who not only collected most of the species, but also published two valuable papers, in 1872 and 1887, upon them. Most of the specimens described and illustrated in the present account were received from Garrett.

Key to Vitian Species.

a. Shell solid, dull brown or decorticated; oblong, the last whorl more or less cylindric; *not spirally wrinkled;* columella very strongly spiral.

b. Large and solid, usually covered with a yellowish or brown cuticle; alt. 67–77 mill. *seemanni*, p. 100.

b[1]. Smaller, wanting cuticle in adults; alt. 47–54 mill. *koroensis*, p. 101.

b[2]. Smaller, cuticle olive-yellowish; alt. 43 mill. *kantavuensis*, p. 101.

a[1]. Ovate or oblong, with *more or less spiral corrugation or mallеation;* brown or maculate with green.

b. Brown or olivaceous, with a heavy parietal callus; aperture whitish.

c. Ovate, the columella bearing a heavy callous lobe far within. *paeteli*, p. 102.

c^1. Ovate, columellar fold moderate; olivaceous, with bluish-white aperture. *graeffei*, p. 104.

c^2. Oblong, the columellar fold rather weak. *garretti*, p. 103.

b^1. Striped or spotted with green on a yellowish or pale ground, the parietal callus normally thin and transparent.

c. Columellar fold bearing a strong callous lobe in adults; mouth pale; lip strongly reflexed. *gracilis*, p. 110.

c^1. Columellar fold moderate; lip expanded rather than reflexed.

d. Short and obese, the diam. more than half the alt.; aperture very large with well expanded orange lip. *hoyti*, p. 105.

d^1. Diam. about half the alt. or less.

e. Cuticle yellowish maculate with green; lip but slightly expanded, usually orange colored; alt. about 58 mill. *elobatus*, p. 105.

e^1. Olivaceous, unmarked, the mouth bluish-white. *graeffei*, p. 104.

e^2. Shell more slender, smaller, with continuous zigzag stripes; alt. 41–49 mill. *guanensis*, p. 107.

e^3. Shell ovate, more or less maculate or denuded of cuticle; alt. 30–41 mill. *pfeifferi*, p. 109; *vitiensis*, p. 110; *ochrostoma*, p. 108.

a^2. Shell thin, ovate, uniform white or with brown or olive variegation; lip broadly reflexed, white.

b. Large, alt. 50–59 mill., roughly malleated, variegated. *malleatus*, p. 112.

b^1. Smaller, alt. 44–50 mill., wrinkle-striate, white. *morosus*, p. 113.

Section *Euplacostylus* Crosse, 1875.

Terrestrial species, with the shell solid, dull brown or denuded of cuticle, oblong and more or less cylindrical, the columella with a strong spiral trend; 2 to 2½ apical whorls pitted when unworn. Type *P. seemanni*.

P. SEEMANNI (Dohrn). Pl. 39, figs. 58, 59, 60.

Shell perforate or umbilicate, oblong-fusiform, solid and strong; flesh-tinted or yellowish under a yellowish-brown, olivaceous or chestnut cuticle, which is wanting on the spire, denuded below the suture, and usually shows zigzag paler and denuded stripes radiating from above. Surface scarcely shining, roughened by moderate growth-wrinkles, the earlier $2\frac{1}{2}$ whorls punctate. Spire high-conic, often yellow above, the apex obtuse. Whorls 5 to $5\frac{1}{2}$, moderately convex, the last whorl long, often cylindrical.

Aperture ear-shaped, white, flesh-colored or brown within, acuminate above; peristome rather thick, reflexed, broad, its convex face white, buff or pale flesh-tinted; outer lip more or less bent inward about the middle, its upper third distinctly narrower; columella with a strong, calloused fold above; parietal callus varying from thin to rather heavy.

Alt. 77, diam. 30; aperture with peristome 46 mill.

Alt. 67, diam. 28; aperture with peristome 40 mill.

Kandavu Island, Viti group, on the ground (Garrett).

Bulimus seemanni DOHRN, P. Z. S. 1861, p. 207, pl. 26, f. 6.—CROSSE, Journ. de Conchyl., 1864, p. 123; 1875, p. 10.—PFR., Monog. vi, p. 13; viii, 27; Novit. Conch. iii, p. 474, pl. 102, f. 18.—GARRETT, Amer. Journ. of Conch. vii, 1872, p. 232.—*Placostylus seemanni* MOUSSON, J. de C. 1870, p. 126.—TAPPORONE-CANEFRI, Viag. "Magenta," Zool., p. 85.—SMITH, P. Z. S. 1884, p. 270.—GARRETT, P. Z. S. 1887, p. 181.—KOBELT, Conchyl. Cab., p. 14, p. 2, f. 2–5.—*Otostomus seemanni* SEMPER, Reisen in Archip. Phil., Land-moll., p. 150, pl. 16, f. 9.

"Though subject to considerable variation in size and shape, it may be distinguished by its rather slender form, whitish horn-color beneath a yellowish or olive-brown epidermis, which is sometimes ornamented with waved or zigzagged stripes. The surface, though coarsely striated with lines of growth, is seldom marked by transverse corrugation. The auriculate-shaped aperture is narrow, white, though sometimes tinted with fulvous, and the white lip is considerably expanded and slightly reflected, and frequently contracted above. Length from 52–77 mill. Like all the ground species, it is very frequently decorticated" (*Garrett*).

P. KANTAVUENSIS (Crosse). Pl. 39, fig. 66, 67.

Shell almost covered perforate, cylindric-fusiform, rather solid, longitudinally wrinkle-striate, obsoletely submalleate; rose-whitish under an olivaceous-yellowish cuticle which is here and there zigzag-streaked with whitish. Spire somewhat cylindrically conic, the suture somewhat irregular, impressed. Whorls 5, a trifle convex, the earlier three rose colored, the last descending, longer than the spire, subcylindrical, a little compressed in the middle, slightly tapering basally.

Aperture ear-shaped, whitish inside, effuse at the base; peristome white, broadly expanded, reflexed, the margins joined by a parietal callus, outer margin subcompressed in the middle, flexuous, becoming narrower toward its insertion above; columellar margin with a strong twisted fold. (*Crosse.*)

Alt. 43, diam. 16½; aperture with peristome 26 mill. long.

Kandavu Island, Viti group (John Brazier).

Bulimus kantavuensis CROSSE, Journ. de Conchyl., 1870, p. 250; 1871, p. 105, pl. 5, f. 3; 1875, p. 10.—MOUSSON, J. de C., 1870, p. 229 (no description).—PFR., Monogr. viii, p. 29.—*Placostylus kantavuensis* GARRETT, P. Z. S., 1887, p. 182.—KOBELT, Conchyl. Cab. p. 128, pl. 31, f. 7, 8 (copied from Crosse).

Closely allied to *P. koroensis*, but differing in the smaller size and persistence of the cuticle. None but the original specimens are known. Type in coll. of the Journal de Conchyliologie.

P. KOROENSIS (Garrett). Pl. 39, figs. 61, 62, 63, 64, 65.

Shell imperforate or rimate, oblong and narrow, thick and solid. Surface lusterless, dull pink-tinted, sometimes becoming pale-orange toward the apex; *totally denuded of cuticle in adults*, or retaining only small shreds, the young covered with a thin, pale yellowish-brown cuticle; sculpture of irregular growth-wrinkles, and sometimes a faint, subobsolete spiral corrugation. Apex obtuse, slightly over two earlier whorls punctulate. Whorls about 5, at first but slightly convex, the penultimate more swollen, *last whorl compressed laterally*, more or less cylindrical, sometimes girded in and distorted.

Aperture white or flesh-tinted within, ear-shaped; outer lip moderately expanded (sometimes reflexed), strongly thickened within, white or dirty-yellowish, bent in near the middle. Columella with *a very strong spirally-entering fold.*

Length 54, diam. 19, longest axis of aperture with lip 30 mill.

Length 47, diam. 20, longest axis of aperture with lip 30 mill.

Koro Island, Viti Archipelago, in the central valleys, on the ground (Garrett).

Bulimus koroensis Garrett, Amer. Journ. Conch. vii, 1872, p. 236, pl. 18, f. 9.—Crosse, Journ. de Conchyl., 1875, p. 9, pl. 1, f. 5. —Pfr., Monogr. viii, p. 29.—Schmeltz (?), Journ. des Mus. Godeffroy xii, p. 161.—Schmeltz, Verhandl. Vereins f. Naturwissensch. Unters. zu Hamburg ii, 1875, p. 215 (1876).—*Placostylus koroensis* Schmeltz, Mus. Godeffroy Catal. v, p. 92. *Cf.* Journ. de Conchyl., 1881, p. 73.—*P. koroensis* Garrett, P. Z. S., 1887, p. 182.—Kobelt, Conchyl. Cab., p. 26, pl. 6, f. 6, 7.

"This singular species is peculiar to the island of Koro, where it is very abundant in the central valleys. They were found lurking under loose stones, rotten wood, and among decayed leaves. About one specimen in a hundred exhibits slight traces of a brownish horn-colored epidermis, disposed in irregular longitudinal stripes. They are often much more attenuated than the dimensions [53, 18 mill.] given above. Very old specimens are frequently denticulated on the peristome" (*Garrett*).

The figures sufficiently show the variations mentioned by Garrett. The original figure was from a scarcely mature shell which retained traces of the cuticle. Type in coll. Acad. Nat. Sciences.

Dr. Schmeltz considers *koroensis* and *kantavuensis* specifically identical. In the large series I have seen of shells collected by Garrett, there are none agreeing with Crosse's figures and description in size and pattern of cuticle, but it is not unlikely that *koroensis* might well be subordinated to *kantavuensis* as a variety. Further investigation of the Kandavu fauna is necessary, to confirm the locality of the latter species, and its range of variation.

Section *Callistocharis* Pilsbry, 1900.

Arboreal species, with yellow and green variegated or white shells, and convex body-whorl. Type *P. malleatus.*

P. paeteli Kobelt. Pl. 44, figs. 11-15.

Shell covered rimate, long, ovate-conic, solid, rudely and irregularly striate-costate, the upper part of the last whorl being scarred and malleate; yellowish-brown, the spire more yellow, the penult. and

part of last whorl very prettily marked with zigzag whitish streaks. Spire turrited-conic, with small, scarcely blunted apex. Whorls 6, separated by a deep and lightly crenate suture, the early whorls but little convex, the later flattened above, more convex below; the last whorl about three-fifths the total length, slightly compressed below, descending to the aperture.

Aperture slightly oblique, slightly longer than the spire, acuminate above, bluish within; peristome unexpanded, thickened, obtuse, buff-whitish, the terminations joined by a thin parietal callus with thickened outer edge. Columella arcuate, with a regularly curved, not much projecting fold above, superposed upon which there is a very strong, projecting white callus, visible by rolling the shell and looking obliquely into the aperture. (*Kobelt.*)

Alt. 72, diam. 35, alt. aperture 38 mill. (Kobelt, figs. 11–13).

Alt. 65, diam. 29, alt. aperture 34 mill. (Specimen, figs. 14, 15). *Viti Is.* (Paetel coll.).

Placostylus paeteli KOBELT, Conchyl. Cab., p. 65, pl. 16, f. 1, 2 (1891).—*Bul. moussoni* Graeffe, in Berlin Mus.

Not closely allied to any other Vitian species. The unusually heavy callous fold upon the columella is not visible from the front, but may be seen only by looking obliquely into the aperture. The single specimen before me is somewhat smaller than the type in the Berlin Museum, though evidently older, the inner lip being very heavily calloused and straighter than in Kobelt's figure. Figure 14 represents an obliquely basal view of this shell.

P. GARRETTI Pilsbry, n. sp. Pl. 44, figs. 16, 17, 18.

Shell perforate, oblong-fusiform, moderately solid, flesh-tinted under a persistent and rather strong chestnut or olive-brown cuticle, somewhat streaked, and usually with a series of darker brown blotches below the suture, from which paler or denuded zigzag stripes descend upon the penultimate whorl. Surface somewhat shining, moderately striate and wrinkled, rather coarsely corrugated spirally, the corrugation becoming obsolete near the termination of the last whorl; $2\frac{1}{2}$ early whorls punctate. Whorls slightly over 5, moderately convex, the last oblong.

Aperture long-ovate, somewhat oblique, brown inside; peristome narrowly reflexed, pure white or brown-tinted; columella dilated above, with a long gentle fold; parietal callus thin and translucent, becoming heavy in old shells.

Alt. 70, diam. 25; aperture with peristome 36 mill.

Alt. 62, diam. 25; aperture with peristome 35 mill.

Habitat unknown.

Much more slender than *P. elobatus*, with coarser corrugation, entirely different coloration and very narrowly reflexed lip. It lacks the internal callous fold of *P. paeteli*, which is a species of stouter contour. The general aspect of the shell inclines me to believe it from the Viti group.

P. GRAEFFEI (Crosse). Pl. 43, fig. 6.

"About the same size as *elobatus*, but is much less rugose, the base less produced, and is of a yellowish-olive color with a bluish-white aperture.

"About the same size and shape as *P. elobatus*, but is a smoother shell, and the color of my two specimens is olivaceous without any markings. The aperture is whitish, and the columellar fold is more horizontal than in the latter species" (*Garrett*).

Viti Levu, in the central portion at Vuni-Vatu (Dr. Graeffe).

B. colubrinus Pfr., MOUSS., Journ. de Conchyl. 1870, p. 125, footnote.—*Placostylus moussonii* Graeffe, in SCHMELTZ, Mus. Godeffroy Catal. v, p. 93 (1874); no description.—*Bulimus* sp., GARRETT, Amer. Journ. Conch. vii, 1872, p. 232.—*Bulimus moussoni* Graeffe, CROSSE, Journ. de Conchyl. 1875, p. 11, pl. 1, f. 6 (not *Bulimus moussoni* Pfr.).—*Bulimus* (*Placostylus*) *græffei* CROSSE, t. c., p. 13 (exclusive of var. *minor;* no description).—*Bulimus gräffei* Crosse, PFR., Monogr. viii, p. 30.—*Placostylus graeffei* Garrett, P. Z. S. 1884, p. 184.—*Placostylus* (*Charis*) *moussoni* Graeffe, KOBELT, Conch. Cab. p. 125, pl. 31, f. 1 (copy from Crosse).

This species has not been formally defined, but is known by Garrett's descriptive notes and Crosse's figure. The name *Placostylus moussoni* Graeffe in Schmeltz, is prior to *graeffei*, and not preoccupied, but was absolutely without definition, and so far as the record goes, was based upon *P. elobatus* of Mousson. It would really be a synonym of *elobatus*, for Mousson did not call the present species *elobatus*, but *colubrinus*, previous citations having been erroneous on this point. Crosse, in 1875, supplies a figure, and uses the name *Bulimus moussoni*, which was preoccupied by Pfeiffer; but he proposes *B. græffei* as a substitute. This name has properly been accepted by Pfeiffer and Garrett.

P. HOYTI (Garrett). Pl. 42, figs. 85–88.

Shell umbilicate or compressed umbilicate, obese-ovate, rather solid; flesh-pink under a thin and partly deciduous yellowish cuticle, copiously zigzag-streaked with dark green or olive-green; the spire nude, red or orange-red. Surface marked with growth lines and densely, finely corrugated spirally. Spire short, the apex obtuse, early whorls punctate. Whorls $4\frac{3}{4}$, the last one inflated.

Aperture large, ovate, yellowish inside; peristome broadly expanded, reflexed, pale-edged, orange-red within; columellar margin broadly dilated above, orange-red; columella with a strong spiral fold above. Parietal callus moderate, orange-red.

Alt. 51, diam. 28; length of aperture 40 mill.

Alt. 56, diam. 30; length of aperture 41 mill.

Alt. 45, diam. 24; length of aperture $29\frac{1}{2}$ mill.

Vanua Levu, southward of Natawa Bay; terrestrial (Garrett).

Bulimus hoyti GARRETT, Amer. Journ. of Conch. vii, p. 234, pl. 18, f. 7 (1872).—PFR., Monogr. viii, p. 30.—CROSSE, Journ. de Conchyl. 1875, p. 17, pl. 1, f. 8.—*Placostylus hoyti* SCHMELTZ, Mus. Godeffroy Catal. vi, p. 81.—GARRETT, P. Z. S. 1887, p. 182.—KOBELT, Conchyl. Cab. p. 79, pl. 19, f. 1, 2.

Readily distinguished from *P. elobatus* by its short, obese form, large aperture and expanded lip.

P. ELOBATUS (Gould). Pl. 43, figs. 1, 2, 3, 4.

Shell perforate or umbilicate, long-ovate, moderately solid; yellow or reddish-yellow, with irregular, often interrupted green or olive stripes and spots; the spire denuded of cuticle, flesh-colored, yellowish or white. Surface rather dull, sculptured with slight growth-lines and a dense conspicuous spiral corrugation, the wrinkles oblique above, often anastomosing. Apex obtuse, $2\frac{1}{2}$ early whorls pitted when not eroded. Whorls 5 to $5\frac{1}{2}$, slightly convex, the last moderately inflated, tapering below.

Aperture oblong, typically reddish-yellow inside, becoming orange toward the peristome, which is pale-edged, blunt, and a trifle expanded; columella obliquely folded above, a spiral callous ridge of whitish color being superposed in old shells; the columellar margin dilated above; parietal callus thin and transparent.

Alt. 59, diam. 27; longest axis of aperture 33 mm.

Alt. 57, diam. 26; longest axis of aperture 34½ mm.

Alt. 58, diam. 25; longest axis of aperture 32 mm.

Vanua Levu, Viti Is.

Bulimus elobatus GLD., Proc. Bost. Soc. N. H., 1846, p. 190; U. S. Expl. Exped. Shells, p. 72, fig. 84.—PFR., Monogr. ii, p. 184; iii, 419; iv, 479; viii, p. 30.—CROSSE, Journ. de Conchyl., 1864, p. 140 (excl. var.); 1875, p. 13.—GARRETT, Amer. Journ. of Conch., 1872, p. 232, pl. 18, f. 2.—*Placostylus elobatus* MOUSS., J. de C., 1870, p. 124.—SCHMELTZ, Catal. Mus. Godeffroy v, p. 93.—GARRETT, P. Z. S., 1887, p. 180.—KOBELT, Conchyl. Cab. p. 59, pl. 14, f. 2, 3.—*Otostomus* (*Placostylus*) *elobatus* SEMPER, Reisen im Archip. Phil., Landmoll., iii, p. 157, pl. 15, f. 5.—*Bulimus colubrinus* PFR., P. Z. S., 1860, p. 138, pl. 51, f. 4; Malak. Bl., 1861, p. 13; Monogr. vi, p. 29. *Conf.* CROSSE, Journ. de Conchyl., 1875, p. 13, pl. 1, f. 7; 1894, p. 171.—*P. elobatus* var. *colubrinus* KOBELT, Conchyl. Cab. p. 129, pl. 31, f. 9 (copy from Crosse).—? *Bulimus* (*Chavis*) *roseus* Gld., H. & A. ADAMS, Gen. Rec. Moll. ii, p. 147.

The *B. colubrinus* of Pfeiffer was a small specimen, alt. 56 mill., but without varietal characters. Garrett writes as follows:

"This fine species is found abundantly on the ground, and is confined to that part of Vanua Levu lying to the northward and westward of Natawa Bay, and ranges the whole length of the island. The finest examples were procured in the interior."

"This species is restricted to the island of Vanua Levu, where it occurs beneath decaying vegetation. Examples inhabiting the interior of the island are larger and much finer than those found in the forests near the sea-shore. My largest specimens taken in the former location are 66 mill. long, and my smallest (adults) from near the sea-shore are only 46 in length. The shape varies from oblong-ovate to elongate-ovate. It is solid, white or ruddy beneath a fulvous epidermis, and ornamented with longitudinal dark green waved or zigzagged stripes, which are more or less interrupted. The apical whorls are usually reddish. The aperture and lips are usually orange-red, and the throat frequently whitish. The last two whorls are minutely corrugated."

Color-var. *albino* (pl. 43, fig. 5). Substance of the shell white under the cuticle. Aperture bluish-white, the peristome white.

P. GUANENSIS (Garrett). Pl. 42, figs. 93, 94; pl. 41, fig. 84.

Shell umbilicate, oblong-ovate, rather thin but strong, pale buff, zigzag-striped longitudinally with olive or olive-brown, the cuticle so thin as to be often eroded along the front edge of each dark stripe, wanting on the spire, which is buff or reddish-tinted. Surface nearly lustreless, sculptured with growth-wrinkles and densely corrugated spirally, on the spire decussated by impressed spirals cutting fold-like striæ. Apex obtuse, earlier $2\frac{1}{2}$ whorls pitted. Whorls 5, convex, the last variable in degree of elongation.

Aperture long-ovate, whitish or light orange within; peristome expanded, thickened within, varying from orange to white; columella bearing a strong, compressed, white or whitish callous fold above; the outer margin dilated.

Alt. 49, diam. $20\frac{1}{2}$; longest axis of aperture $28\frac{1}{2}$ mill.

Alt. 41, diam. 20; longest axis of aperture $24\frac{1}{2}$ mill.

Gnau (Guan) island, Viti group. (A. J. Garrett.)

Bulimus guanensis GARR., Amer. Journ. Conch. vii, 1872, p. 235, pl. 18, f. 8.—CROSSE, Journ. de Conchyl., 1875, p. 19.—PFR., Monogr. viii, p. 36.—*Placostylus guanensis* SCHMELTZ, Catal. Mus. Godeffroy, vi, p. 81.—GARRETT, P. Z. S., 1887, p. 184.—*Placostylus guanensis* KOBELT, Conchyl. Cab., p. 64, pl. 15, f. 6, 7 (not characteristic).

The shell is smaller than *P. elobatus* and less strongly sculptured spirally; *P. rambiensis* is more delicate and differently colored; and *P. gracilis* has the lip decidedly broader.

The variation in size and contour is remarkable, some shells being much elongated, as in the original figure, while others are short and shaped like *P. rambiensis*, as in Garrett's type, which is only 41 mill. long (fig. 93). The extremes are connected by numerous intervening sizes in the series before me. Garrett writes as follows:

"This graceful species is common and peculiar to Gnau Island, where it lives on trees and shrubs. It may be recognized by its rather thin texture, oblong-ovate or elongate-ovate form, whitish, yellowish, or reddish horn color, ornamented with longitudinal undulating olive green stripes, which are frequently shaded off with white. The surface is rugose, with small transverse corrugations. The aperture is tawny yellow or reddish, rarely white, and the lips, which are but slightly expanded, are more intensely colored than is the throat. Length 45 mill." Types in coll. Acad. Nat. Sciences.

P. OCHROSTOMA (Garrett). Pl. 40, figs. 73, 74.

Shell narrowly umbilicate, *ovate*, thin but moderately solid, pink-tinted white, *in great part denuded of cuticle*, which where retained is very thin, pale buff, with greenish or pale olive streaks or spots. Lustreless, the last whorl or part of it sculptured with rather coarse and irregular but low spiral and descending wrinkles; the spire short, nude and ruddy, apex obtuse. Whorls $4\frac{1}{2}$, the earlier $1\frac{1}{2}$ punctate when not deeply eroded; the last whorl moderately inflated, tapering below.

Aperture ovate, yellowish inside, becoming darker, somewhat yolk-colored toward the lip. Peristome expanded, with pale blunt edge; the basal margin somewhat effuse, columellar margin dilated above, reflexed; columella with a strong regularly curved fold above.

Alt. 32, diam. 17; longest axis of aperture 21 mill.

Alt. $33\frac{1}{2}$, diam. $16\frac{1}{2}$; longest axis of aperture 20 mill.

Alt. 31, diam. 16; longest axis of aperture 20 mill.

Taviuni and Gomea, Viti Is. (Garrett).

Bulimus ochrostoma GARRETT, Amer. Journ. of Conch. vii, 1872, p. 232, pl. 18, f. 3.—PFR., Monogr. viii, p. 36.—CROSSE, J. de Conchyl. 1875, p. 19.—*Placostylus ochrostoma* SCHMELTZ, Catal. Mus. Godeffroy vi, p. 81.—KOBELT, Conchyl. Cab. p. 56, pl. 13, f. 8, 9 (not characteristic).—*Placostylus ochrostomus* (including *rambiensis*) GARRETT, P. Z. S. 1887, p. 183.

Var. RAMBIENSIS (Garrett). Pl. 40, figs. 71, 72.

Larger than typical *ochrostoma*, with the shell-substance white or nearly so, the cuticle generally much more persistent, pale, profusely marked with triangular green spots, or sometimes merely streaks, on the last whorl or half whorl; spiral wrinkle-sculpture the same. Aperture white within, the lip more or less yellow or saffron tinted.

Alt. 38, diam. 20; longest axis of aperture $25\frac{1}{2}$ mill.

Alt. 39, diam. 20; longest axis of aperture 24 mill.

Rambi Island, Viti group (Garrett).

Bulimus rambiensis GARRETT, Amer. Journ. Conch. vii, 1872, p. 233, pl. 18, f. 4.—PFR., Monogr. viii, p. 36.—CROSSE, J. de Conchyl. 1875, p. 19.—*Placostylus rambiensis* SCHMELTZ, Catal. Mus. Godeffroy vi, p. 81.—KOBELT, Conchyl. Cab. p. 125, pl. 31, f. 2, 3 (not characteristic).

In this variety the basal lip is often narrowly reflexed. In his latest paper, Garrett unites *rambiensis* and *ochrostoma*, a conclusion in which I heartily concur, though there has apparently been some divergence which may render the retention of *rambiensis* in a varietal sense advisable.

The species is obviously allied to *P. guanensis*, but differs in the thinner shell and cuticle, usually more inflated form, the less angular columellar fold, and different color-pattern. Garrett found two specimens on that part of Vanua Levu opposite to Rambi Island. He writes as follows: "It is the smallest species, so far known, inhabiting the group. It is rather variable in size, ranging from 28 to 40 mill. in length, and its shape varies from ovate to oblong-ovate. The texture is rather thin, the sculpture the same as on *P. rugosus* [*rugatus*], and the color ruddy corneous or whitish, often with a reddish spire. Though very frequently wholly decorticated, the epidermis, when present, is very thin, light fulvous, and usually beautifully mottled with green, which is occasionally disposed in zigzag pattern. The aperture and lips are more or less intense saffron-yellow, paler in the throat. The columellar fold is not so conspicuous, and is more vertical than in the preceding species (*P. rugatus*). The peristome, though usually simple, is often slightly expanded, particularly so in the Rambi shells, some of which have the lip slightly reflected."

Garrett's types of *ochrostoma* and *rambiensis* are in the collection of the Academy.

P. PFEIFFERI Kobelt. Pl. 37, figs. 42, 43.

Shell small, covered-perforate, ovate-fusiform, solid, and thick, striate, the last whorl closely sculptured with obliquely spiral wrinkles; reddish flesh-colored, the last whorl whitish with olive-green markings, which are partly arranged in flammule-streaks, partly in spiral bands. Spire rather high conic, eroded, of a handsome red color, the apex somewhat obtuse. Whorls 5, separated by a lightly impressed suture, becoming deeper below, lightly crenulated and white edged; penultimate whorl more convex, the last whorl descending in front, scarcely inflated, a little longer than the spire.

Aperture scarcely half the length of the shell, acutely ovate, somewhat ear-shaped, nearly vertical, but retracted a little below, yel-

lowish inside; peristome thickened, spreading below, but scarcely reflexed, yellowish, the margins approaching and connected by a thin but distinct callus; columellar margin scarcely reflexed, bearing a strong, twisted and compressed whitish fold above. (*Kobelt.*)

Alt. 38, diam. 20, aperture 20 mill.

Viti Levu, in the interior.

Bulimus elobatus Pfr., Novit. Conch. iii, p. 418, pl. 95, f. 7, 8 (not of Gould).—*Placostylus pfeifferi* Kobelt, Conchyl. Cab. p. 130, pl. 32, f. 2, 3 (1891).

A small, solid species, probably near *P. ochrostoma;* considered by Pfeiffer a variety of *P. elobatus*, and by Crosse referred to *P. graeffei* as a var. *minor*. It is shorter and wider than *P. vitiensis* Garrett. The type is in Dohrn's collection.

P. vitiensis Garrett. *Unfigured.*

"Shell umbilicated, oblong-ovate, rather solid, slightly shining; rosy flesh color beneath a thin translucent epidermis, which is decorated with longitudinal olive-green zigzag stripes; surface of the last two whorls with small longitudinal striæ and small transverse corrugations; spire obtuse, decorticated, minutely punctured, two-thirds the length of the shell; whorls 5, moderately convex, the last one attenuated at the base; aperture slightly oblique, oblong, auriform, light-fulvous; peristome white, rather widely expanded and somewhat reflected; columellar lip dilated, and the fold oblique and prominent." Length 41, diam. 17 mill. (*Garrett.*)

Placostylus vitiensis Garr., Schmeltz, Mus. Godeffroy Catal. vi, p. 81 (no description).—Garrett, P. Z. S., 1887, p. 184.

"I obtained 20 living examples of this species, which were collected by the natives at Na Viti Levu Bay, on the N.-E. coast of Viti Levu. It is smaller and a more graceful species than *P. fulguratus* and the base is more contracted." (*Garrett*).

P. gracilis (Broderip). Pl. 41, figs. 80, 81, 82, 83.

Shell openly compressed-umbilicate, oblong, rather solid, pink or white under a pale olive-buff, yellow or rufous-buff cuticle, marked with irregular or zigzag olive flames, streaks and spots; the spire uniform red or yellowish-white. Surface somewhat glossy, closely striated and strongly, densely corrugated spirally. Apex obtuse; whorls $4\frac{1}{2}$ to $4\frac{3}{4}$, moderately convex, the last oblong, inflated.

Aperture ovate, white or brown-tinted inside; peristome white, *well reflexed*, the columellar margin dilated, encroaching upon the parietal wall; columella with a moderate or strong and heavily calloused fold above.

Length 51, diam. 25; longest axis of aperture 33 mill.

Length 42, diam. 20½; longest axis of aperture 27½ mill.

Viti Levu and Oralau Is., Viti group, on trunks and foliage of trees (Garrett).

Plekocheilus gracilis Brod., P. Z. S., 1840, p. 182.—*Bulimus fulguratus* Jay, Revue Zool., 1842, p. 80; Guerin's Mag. de Zool., 1843, pl. 62.—Philippi, Abbild. u. Beschreib. neuer Conch., ii, p. 10, pl. 3, f. 2.—Pfr., Monogr., ii, p. 55; iii, 316; iv, 378; vi, 23; viii, 34.—Reeve, Conch. Icon., pl. 29, f. 175.—Gld., U. S. Expl. Exped., p. 80, fig. 77.—Mouss., J. de Conchyl., 1865, p. 195.—Crosse, J. de Conchyl., 1864, p. 137; 1875, p. 17.—Garrett, Amer. Journ. of Conch., 1872, p. 231, pl. 18, f. 1.—*Placostylus fulguratus* Mousson, J. de Conchyl., 1870, p. 125.—Schmeltz, Catal. Mus. Godeffroy v, p. 92.—Garrett, P. Z. S., 1887, p. 180.—Kobelt, Conchyl. Cab., p. 60, pl. 14, f. 4, 5, 6.—*Charis fulguratus* Feld., Verh. Zool.-bot. Ges. Wien, 1869, p. 874.—*Otostomus fulguratus* Semper, Reisen im Archip. Phil., Landmoll., p. 158, pl. 17, f. 10 (teeth).—*Bulimus eximius* Reeve, Conch. System. ii, p. 81, pl. 173, f. 2 (1842).

Bulimus crassilabrum Garrett, Amer. Jour. Conch., vii, 1872, p. 233, pl. 18, f. 5.—Pfr., Monogr., viii, p. 35.—Crosse, J. de Conchyl., 1875, p. 18.—*Placostylus crassilabrum* Schmeltz, Catal. Mus. Godeffroy v, p. 93.—Kobelt, Conchyl. Cab., p. 61, pl. 14, f. 7, 8.—*Placostylus rugatus var. crassilabris* Garrett, P. Z. S., 1887, p. 183.

Bulimus rugatus Garrett, Amer Journ. Conch. vii, 1872, p. 234, pl. 18, f. 6.—Crosse, J. de C., 1875, p. 18.—Pfr., Monogr., viii, p. 35.—*Placostylus rugatus* Schmeltz, Catal. Mus. Godeffroy, vi, p. 81.—Kobelt, Conchyl. Cab., p. 126, pl. 31, f. 4, and var. *minor*, f. 5, 6.—Garrett, P. Z. S., 1887, p. 183.—*P. rugatus* Pfr.-Cless., Nomencl. Hel. Viv., 1878, p. 217.

This was the first Vitian *Placostylus* to be described; and as the name *gracilis* is pre-occupied in neither *Plekocheilus* or *Placostylus*, the propriety of restoring it will be apparent.

The spiral corrugation, while varying a good deal in degree of

coarseness, is perhaps never so fine as in the variety *rugatus*, and the lip is less developed than in var. *crassilabrum*. In *P. elobatus* the lip is merely a little expanded, not reflexed as in *gracilis*.

Var. RUGATUS (Garrett). Pl. 42, figs. 89, 90.

Rather shorter than *P. gracilis*, and with perceptibly finer spiral corrugation; whorls $4\frac{1}{4}$; aperture large, white, the lips white or faintly cream-tinted; cuticle pale buff, with olive spots and streaks, the spire pink or whitish.

Alt. 43, diam. $22\frac{1}{2}$; longest axis of aperture 29 mill.

Alt. 41, diam. 22; longest axis of aperture $27\frac{1}{2}$ mill.

Alt. 40, diam. $21\frac{1}{2}$; longest axis of aperture 27 mill.

Vanua Levu, Viti Is.; arboreal (Garrett).

Distinguished from *P. gracilis* chiefly by the somewhat larger aperture, the last whorl being larger and rather more inflated, the outer lip consequently more evenly arched; these differences being correlated with geographic isolation. Kobelt's var. *minor* of *P. rugatus* has no differential characters, being merely a moderately small shell, alt. 40.5 mill.

Var. CRASSILABRUM (Garrett). Pl. 42, fig. 91, 92.

Similar to var. *rugatus* in the short spire and fine corrugation, but more solid, the peristome is strongly recurved and heavily thickened; columellar fold stronger.

Alt. 43, diam. $22\frac{1}{2}$; longest axis of aperture, including peristome, 30 mill.

Alt. 41, diam. $20\frac{1}{2}$; longest axis of aperture, including peristome, 28 mill.

Vanua Levu, in the interior, at about the middle of the island; arboreal.

Some shells are almost wholly denuded of the thin cuticle, exposing the white or slightly pink-tinted substance of the shell; the spire is buff or flesh-tinted.

The types of *rugatus* and *crassilabrum* are in the collection of the Academy.

P. MALLEATUS (Jay). Pl. 41, figs. 75, 76, 77.

Shell compressed-umbilicate, oblong-ovate, rather thin; *white, with brown or olive-brown irregular blotches*, often arranged in longitudinal stripes, sometimes triangular or zigzag, smaller spots being scattered

among the larger; the spire white. Surface nearly lusterless, sculptured with irregular growth-wrinkles, and either conspicuously or lightly malleated spirally. Whorls nearly 5, slightly convex, the last inflated.

Aperture long-ovate, white, faintly brown-tinted, or with gray markings within; peristome broadly reflexed, especially below, white; columellar margin dilated, free. Columella having a rather angular fold above.

Alt. 59, diam. 30; aperture 39 mill.

Alt. 50, diam. 25; aperture 34 mill.

Viti Levu and Ovalan Is., Viti group; arboreal (Garrett).

Bulimus malleatus Jay, Revue Zool., 1842, p. 80; Guerin's Mag. de Zool., 1843, pl. 61.—Philippi, Abbild. u. Beschreib. ii, p. 10, *Bul.*, pl. 3, f. 4.—Pfr., Monogr. ii, p. 55; iii, 316; iv, 378; vi, 23; viii, 34.—Garrett, Amer. Journ. Conch., vii, 1872, p. 231.—Reeve, Conch. Icon., pl. 29, f. 174.—Desh. in Fér., Hist., p. 47, pl. 144, f. 11, 12.—Gld., U. S. Expl. Exped., Moll. p. 81, f. 78.—Chenu, Man. Conch., i, p. 436, f. 4201.—Crosse, J. de C., 1864, p. 136; 1875, p. 20.—*Placostylus malleatus* Mouss., J. de C., 1870, p. 125.—Schmeltz, Catal. Mus. Godeffroy, v, p. 92.—Garrett, P. Z. S., 1887, p. 179.—Kobelt, Conchyl. Cab., p. 29, pl. 7, f. 2, 3.

The malleation is inconspicuous in some shells, and the characteristic olive-brown blotches are sometimes wanting or very sparse. Such specimens resemble *P. morosus*, but may be known by the larger size, more oblong aperture, flattened basal lip, etc. In a series of fifteen specimens before me, no two are alike in markings.

P. morosus (Gould). Pl. 41, figs. 78, 79.

Shell compressed-umbilicate, rather acutely ovate, thin, *pure white throughout.* Surface but slightly shining, rudely, coarsely and irregularly wrinkled longitudinally, slightly malleated in places. Spire rather slender, the apex obtuse, the earlier whorls punctate. Whorls 5, moderately convex, the last inflated.

Aperture large, ovate, vertical, white; the peristome broadly reflexed and recurved at the edge, its face convex; columellar margin dilated, the columella having a rather strong fold above.

Alt. 50, diam. 26; aperture with peristome 33 mill.

Alt. 44, diam. 23½; aperture with peristome 30 mill.

Vanua Levu, *Rambi*, *Koro*, *Taviuni*, *Gomea*, *Lanthala* (Garrett) and *Viti Levu* (Graeffe), Viti Is. Arboreal.

Bulimus morosus Gld., Proc. Bost. Soc. N. H. 1846, p. 190; U. S. Expl. Exped., Shells, p. 72, fig. 82.—Pfr., Monogr. ii, p. 56; iii, 316; iv, 373; vi, 86; viii, 37.—Garrett, Amer. Journ. Conch. vii, 1872, p. 232.—Crosse, Journ. de Conchyl. 1875, p. 20, pl. 8, f. 1.—Kobelt, Jahrb. d. d. malak. Ges. ii, 1875, p. 225, pl. 7, f. 7, 8.—*Placostylus morosus* Mouss., J. de C., 1870, p. 125.—Schmeltz, Catal. Mus. Godeffroy v, p. 93.—Smith, P. Z. S., 1884, p. 270.—Garrett, P. Z. S. 1887, p. 181.—Kobelt, Conchyl. Cab. p. 30, pl. 7, f. 4, 5.—*Bulimus elobatus* var. *minor* Crosse, J. de C. 1864, p. 140.

This very distinct arboreal species has a wider range than any other species inhabiting the Vitian group. The pointed-ovate form, irregularly wrinkled and dead white surface and large aperture with broadly spreading and reflexed lip, are its prominent features. It is less elongated and less malleated than *P. malleatus*. According to Garrett "There exists a rare abbreviated variety on the west end of Vanua Levu, which exhibits a few olivaceous markings similar to those on the latter species."

Subgenus Diplomorpha Ancey, 1884.

Diplomorpha Ancey, Il Naturalista Siciliano, iii, p. 344 (Sept. 1, 1884). Type *Partula layardi* Braz.—Hartman, Proc. Acad. Nat. Sci. Phila., 1886, p. 35.—Not *Diplomorphus* Giraud, Ann. Soc. Ent. Fr. (5), i, p. 409, 1871 (*Hymenoptera*).

Shell small, compactly ovate, umbilicate or rimate, solid, composed of $3\frac{1}{2}$–$5\frac{1}{2}$ convex whorls, the earlier $1\frac{1}{2}$ densely sculptured with waved or crinkled wrinkles when not eroded. Cuticle thin and lineolate when present. Aperture ovate, the peristome thickened or reflexed, usually stained with orange or red within. Type *D. layardi*.

Distribution, New Hebrides.

A group of small species, mostly described by Dr. W. D. Hartman, intermediate between *Partula* and *Placostylus* in appearance, but shown to belong to the latter group by the characteristic orange-red color usually dyeing the interior, and the apical sculpture, which is very unlike that of any *Partula* (pl. 72, fig. 17).

The lineolate cuticle is also a bond between these species and the

Placostyli of the *P. hartmani* group. The statement of Dr. Hartman that the anatomy is like that of *Partula* was evidently not based upon an adequate knowledge of the subject. I do not regard the present group as in any true sense intermediate between *Partula* and *Placostylus*.

If *Diplomorpha* be held to be preoccupied by the prior *Diplomorphus*, it may be replaced by *Hebridaria*.

Key to Species.

a. Length of aperture much exceeding half that of the shell; whorls $3\frac{1}{2}$–$4\frac{1}{2}$.

b. A parietal tooth and columellar fold developed. *layardi*, p. 115.

b^1. No parietal tooth or distinct columellar fold.

c. Aperture vertical.

d. Ovate, outer lip hardly expanded, orange-red; whorls $3\frac{3}{4}$. *brazieri*, p. 116.

d^1. Obese; outer lip well expanded or reflexed; cuticle lineolate.

e. Last whorl much dilated; umbilicus very ample. *peasei*, p. 117.

e^1. Last whorl less dilated, umbilicus smaller. *delatouri*, p. 117.

c^1. Aperture oblique; peristome reflexed; whorls $4\frac{1}{2}$. *coxiana*, p. 118.

a^1. Length of aperture about half that of the shell, or less; whorls $5\frac{1}{2}$.

b. Strongly plicate at the sutures. *ruga*, p. 119.

b^1. Not plicate. *bernieri*, p. 119.

P. LAYARDI ('Brazier' Hartman). Pl. 72, figs. 1–5, 17.

Shell umbilicate, oval, very solid and strong, dull and lusterless, wanting cuticle, the surface coarsely, irregularly wrinkled in harmony with growth-lines, usually stronger, fold-like below the suture; white throughout, or yellowish; orange-tinted or dull brown, deepening to purplish or dull red behind the lip. Whorls $3\frac{1}{2}$ to $3\frac{3}{4}$, the apex small, rather obtuse, earlier $1\frac{1}{2}$ whorls densely and finely sculptured with waved and anastomosing wrinkles; sutures deeply impressed; last whorl large, inflated. Aperture ear-shaped, but slightly oblique, and either with the peristome entirely white, or

deep orange-scarlet, paler in the throat and on the face of the lip; peristome expanded or subreflexed, *its face moderately or very much thickened;* thickened within, but somewhat excavated and sinuous near the upper insertion; columellar margin reflexed, partially closing the umbilicus, thickened within, forming a more or less distinct angle with the basal margin; *bearing a very strong, tooth-like callous fold above.* Parietal callus rather heavy, *bearing a high, compressed tooth* in or near the middle, situated well inward.

Alt. 22, diam. 13.7, longest axis of aperture 15 mill.

Alt. 18.2, diam. 12.7, longest axis of aperture 12.7 mill.

New Hebrides: *Vate Island.*

Partula layardi Brazier, Ancey, Il Naturalista Siciliano iii, p. 344 (Sept. 1, 1884), no description.—Hartman, Proc. Acad. Nat. Sci. Phila., 1886, p. 35, pl. 2, f. 18 (no description).

This species has not hitherto been described, as Ancey gave only a diagnosis of his group *Diplomorpha*, and Hartman gave a figure. The latter however may be held to define the species. I cannot find that Mr. Brazier ever described the species, and Hartman, who gave me his MSS. bibliographic catalogue of *Partula* and *Diplomorpha*, revised within a year or two of his death, leaves a blank in place of a reference to Brazier.

Some apparently fresh specimens are quite white throughout (fig. 5), while others are richly colored. None in a considerable series before me seems to have any trace of the cuticle, though it may possibly be present on some dark specimens (figs. 1, 2).

The typical form plate 72, figs. 1, 2, has the lip only moderately thickened, and the exterior of a dull brown color. Other specimens have the lip greatly thickened and white or brilliant orange, and the exterior is either orange, purplish or white.

P. brazieri (Hartman). Pl. 72, fig. 6.

Shell umbilicate, ovate, moderately solid, the specimens yet known without cuticle, whitish-yellow, becoming bright yellow and then red-orange behind the lip, the spire orange. Surface rather coarsely wrinkle-striate. Whorls $3\frac{3}{4}$, convex, the last inflated, very slowly and slightly ascending in front. Aperture ovate, vertical, yellowish within; *peristome red-orange throughout*, the outer lip very slightly expanded, becoming expanded below, the columellar margin reflexed. Columella concave below, straightened above, not truncate; parietal

callus rather thin, yellowish. Alt. 18.2, diam. 12.8, longest axis of aperture 11.6 mill. New Hebrides: *Aura Island.*

Diplomorpha brazieri Hartman, Proc. Acad. Nat. Sci. Phila., 1889, p. 93, pl. 5, f. 6 (June, 1889).

This very distinct species differs from others in the almost unexpanded outer lip. It is probably nearest *P. layardi*, which is very different in the aperture. Described and figured from the type.

P. peasei (Cox). Pl. 72, figs. 7, 8, 9.

"Shell deeply and openly umbilicated, ovately conical, very broadly inflated toward the base; spire short, broadly conical; whorls 5, convex, last rapidly increasing in size and inflated; suture impressed; aperture squarely ovate, obliquely produced, lip and columella white, thickened, and broadly reflected, interior of aperture orange-red; covered with a striated dark chestnut epidermis. Length 0.94, breadth 0.70 of an inch." (*Cox.*)

Solomon Is. (Rainbird).

Partula peasei Cox, Proc. Zool. Soc. Lond., 1871, p. 644, pl. 52, f. 2.—Pfr., Monogr. viii, p. 208.

Named in honor of W. Harper Pease. I doubt the locality assigned to this species. It is evidently very near *P. delatouri* Hartm., from which it differs in the more inflated last whorl and far more ample umbilicus. The single specimen before me (pl. 72, figs. 7, 8) is denuded of cuticle, the last two whorls being flesh-tinted, those above orange-tinted. Whorls $4\frac{1}{2}$, convex, the last much inflated, ascending in front, the later half obliquely produced below; a distinct groove is seen behind the lip, running backward, indicated internally by a slight ridge and a distinct prominence within the middle of the outer lip. The aperture is vertical, and the peristome broadly flaring throughout, almost reflexed. There is no prominence on the columella, which is oblique and straight in the middle, and the moderate parietal callus bears no tooth. Alt. 23, diam. 19, longest axis of aperture $16\frac{1}{2}$ mill.

P. delatouri (Hartman). Pl. 72, figs. 10, 11, 12.

Shell umbilicate, obesely ovate, moderately solid, slightly shining. Gray-whitish, deepening to fleshy-purple behind the lip, under a thin yellowish cuticle with narrow darker or reddish-brown streaks. Surface smoothish, with slight growth-wrinkles and some spiral striation, usually rather faint. Whorls $4\frac{1}{4}$–$4\frac{1}{2}$, convex, the last very

large, inflated. Aperture subvertical, pale within, becoming red or orange within the lip, the parietal callus dull crimson within; peristome reflexed and recurved, ivory white, thickened within, especially at and below the middle of the outer lip, there being a projection or blunt tooth just above the middle, and a distinct though wide sinus above. Columella obliquely truncated at base, straight above; parietal wall covered with a heavy, white-edged callus.

Alt. 20, diam. 14, length of aperture 12 mill (type).

Alt. $24\frac{1}{2}$, diam. 17, length of aperture $16\frac{2}{3}$ mill.

Alt. $16\frac{1}{2}$, diam. $11\frac{1}{2}$, length of aperture 11 mill.

New Hebrides: *Aura Island*, in the Malo Pass, on the ground (De la Tour).

Partula (*Diplomorpha*) *De la Touri* HARTMAN, Proc. Acad. Nat. Sci. Phila. 1886, p. 35, pl. 2, f. 19.—MABILLE, Soc. d'Hist. Nat. d'Autun, viii Bull., 1895, p. 411.

Allied to *P. peasei* (Cox), from which it differs in the much less obese last whorl and narrower umbilicus. In other respects the two species are closely allied. *P. delatouri* varies remarkably in size. Hartman's type (fig. 10) is intermediate between the largest and smallest examples.

P. COXIANA Pilsbry, n. n. Pl. 72, figs. 13, 14.

Shell umbilicate, ovate, solid and strong, denuded of cuticle, white, faintly flesh-tinted, becoming fleshy near the lip, the earlier three whorls dull reddish, fading to an obscure yellow toward the suture above. Surface somewhat glossy, irregularly wrinkle-striate, without spiral striation; the first $1\frac{1}{2}$ whorls densely and minutely wave-wrinkled. Spire rather short, the apex obtuse, whorls $4\frac{1}{2}$, rather convex, the last excavated behind the columellar lip, forming a rather open umbilicus, which however scarcely penetrates beyond the last whorl, and is grooved within. Aperture decidedly oblique, ovate, white within, becoming orange toward the lip; peristome broadly reflexed, white, its face convex, thickened within, the outer lip regularly arcuate. Columella orange within and slightly concave, making an angle with the basal margin; its edge very broadly expanded and reflexed; parietal callus rather heavy, white edged, orange within.

Alt. 27, diam. 16, longest axis of aperture 16.3 mill.

New Hebrides: *Aneiteum* (Dr. J. C. Cox).

Diplomorpha coxi HARTMAN, Proc. Linn. Soc. N. S. Wales (2), vi, p. 571, pl. 21, f. 1, 3, 6 (Sept. 30, 1891). Not *P. coxi* Pease, see p. 90.

Not nearly allied to any other species, though *P. bernieri* and *P. ruga* resemble it somewhat. What relation it holds toward *P. coxi* Pse. (see p. 90), said to be from the Solomon Is., remains to be ascertained; but there is evidently some resemblance. Description and figure from the type, in coll. Dr. J. C. Cox.

P. RUGA (Hartman). Pl. 72, fig. 15.

"Shell moderately thick, translucent, ovate-elongate, body-whorl somewhat inflated. Whorls $5\frac{1}{2}$, rounded, suture impressed, crenulate. Four apical whorls with minute spiral striæ, aperture rounded oval, spire half the length, epidermis absent, oblique lines of growth coarse, umbilicus compressed, lip white, reflected, flat, with a heavy deposit on the pillar lip. Color white. Height 28, width 15 mill.; height of aperture 10, width of aperture 6 mill." (*Hartm.*)

New Hebrides: *Segon Island.*

Bulimus ruga HARTM., Proc. Acad. Nat. Sci. Phila., 1890, p. 284, pl. 3, f. 1.—*Diplomorpha ruga* ANCEY, Nautilus xi, p. 26 (July, 1897).

"This shell, of which I have seen but two weather-beaten examples, has the facies of a *Partula*, to which it may eventually be assigned. At every stage of growth the upper angle of the labium leaves a fold on the suture, giving it the appearance of a ruffle, hence the name." (*Hartman.*)

P. BERNIERI (Hartman). Pl. 72, fig. 16.

"Shell moderately thick, translucent, ovate-elongate, whorls $5\frac{1}{2}$, rounded, suture impressed, surface with fine elevated, regular longitudinal striæ. Spire more than half the length, epidermis absent. Color white, umbilicus compressed, aperture irregularly oval, of a beautiful reddish-orange color within, lip white, reflected and concave; pillar lip with a heavy deposit. Height 23, width 15 mill.; height of aperture 10, width of aperture 7 mill." (*Hartm.*)

New Hebrides: *Segon Island* (Bernier).

Bulimus bernieri HARTM., Proc. Acad. Nat. Sci. Phila., 1890, p. 284, pl. 3, f. 2.—*Diplomorpha bernieri* ANCEY, Nautilus xi, p. 26.

Neither *P. ruga* or *P. bernieri* are known to me by specimens.

Dr. Kobelt, ten years ago, referred them to the *Partulidæ* (Bericht ueber die Wissensch. Leistungen in der Malak., 1890, p. 374). Mr. C. F. Ancey later writes as follows concerning them: "I succeeded when in Paris in December, 1896, in procuring specimens. My opinion was they were not at all "Bulimi," as suggested by Dr. Hartman, but modified forms of the *Diplomorpha* type. I now think there can be but little doubt they belong to the latter genus. The texture of shell, outline and external characters are not dissimilar, and in the best preserved specimens of *Diplomorpha ruga* and *bernieri* both have the throat tinged with blood-red color as in the typical *D. layardi*, although the describer mentioned the fact in one of them only. No epidermis remains on the shells, not very numerous indeed, observed by me, but it may be very deciduous, and its absence gives the shells a rough and uneven appearance. I am indebted to Mr. Ph. Dautzenberg for a nice example of *bernieri*, and the shell is somewhat straw-colored like *ruga*. Of the latter, I procured two specimens, one much larger than the type, the other, on the contrary, considerably smaller. The parietal denticle is wanting in the species under consideration, as well as in *Diplomorpha delatouri*."

AUSTRALIAN BULIMOID HELICIDÆ.

Various Australian species, originally described as *Bulimus*, have proved to belong to groups of *Helicidæ* already described in this work. As the contour is suggestive of *Bulimulidæ*, this seems an appropriate place to supply the omitted descriptions. They are figured on plates 4 and 5.

Genus PAPUINA Martens. (Vol. IX, pp. 136, 141).

P. FOLICOLA Hedley. Pl. 4, figs. 69, 70.

"Shell nearly imperforate, of a lengthened oval form, rather thin, smooth, very indistinctly striated, not shining, white, with numerous black and reddish spiral bands, and, on each whorl, more or less distinctly, a band of elongated black or reddish markings; spire acutely conical, bluish at the tip; whorls 6, very slightly convex, last not ventricose, deeply and irregularly stained with black and red; aperture uprightly oval; peristome simple, regular, thin, columellar margin white, slightly expanded and reflected, but not quite covering the umbilical orifice. Length 0.77, breadth 0.40, length of aperture 0.40 inch" (Cox).

Queensland, Australia: *Burnett River*, in the tops of trees (Bidwill). *Miriam Vale*, *Warro*, on leaves of trees in the scrub (Musson); *Maryborough* (Hedley).

Bulimus bidwilli Cox, Monogr. Australian Land Shells, p. 72, pl. 13, f. 11 (1868).—Pfr., Monogr. Hel. Viv. viii, p. 147.—Hedley, Proc. Roy. Soc. Queensland, v, p. 64 (1888).—*Bulimus* (?) *bidwilli* Cox, Hedley & Musson, Proc. Linn. Soc. N. S. Wales (2), vi, p. 557 (1892).—*Papuina folicola* Hedley, Nautilus vii, p. 74 (1893).—Pilsbry, Man. Conch. ix, p. 141.

Not *Papuina bidwilli* Pfr., 1853.

This species has the appearance of a *Rachis*, but is held by Hedley to be a member of the *conscendens* group of *Papuina*.

P. macleayi (Brazier). Pl. 4, figs. 66, 67, 68.

Shell minutely perforated, ovate-conic, extremely thin and fragile, translucent, corneous-brown. Surface shining, sculptured with fine, slight growth-wrinkles, and faintly engraved traces of spiral lines. Spire conic, the apex small, slightly obtuse, smooth, whorls $5\frac{1}{2}$, quite convex, the last inflated. Aperture ovate, slightly oblique; outer lip thin and simple, columellar lip rather broadly reflexed above, nearly closing the umbilical chink.

Alt. 12.5, diam. 8, longest axis of aperture 6.5 mill.

Alt. $7\frac{1}{2}$, breadth 4, length of aperture $4\frac{1}{4}$ lines (Brazier).

East side of Yule Island, *British New Guinea*, on trees in the wet season, at their roots in crevices of coral in the dry (Brazier, type locality for *B. macleayi*); *Mount Ernest Island*, *Torres Strait*, on small trees (Beddome, type locality for *B. beddomei*); *Thursday Id.* (Brazier). Also on the Australian mainland, Port Darwin, at Fannie Bay (Edw. Spalding).

Bulimus macleayi Braz., Proc. Linn. Soc. N. S. Wales i, p. 108 (1876).—Tapparone Canefri, Annali Mus. Civ. di Storia Nat. di Genova, xix, p. 104, pl. 2, f. 16, 17 (1883).—*Bulimus beddomei* Brazier, Proc. Linn. Soc. N. S. Wales i, p. 127 (no description); P. L. S. N. S. W. iv, p. 395, 1880.—Tate, Trans. and Proc. and Rep. Roy. Soc. S. Australia v, p. 50 (1882).—Hedley, Proc. Roy. Soc. Queensl. v, p. 64 (1888); Proc. Linn. Soc. N. S. Wales (2), vi, p. 97 (1891).

This species is evidently a member of the *folicola* group of *Papuina*. *B. beddomei* was never formally described, but Mr. Brazier states

that it differs from *B. macleayi* only in being a little smaller, thinner, pale yellowish-brown irregularly streaked with darker yellow, oblique, narrow lines, the umbilicus smaller.

Figures 66, 67 are from Tapparone Canefri's illustration of the typical form from Yule Island, fig. 68 being drawn from a specimen from Mt. Ernest Island, supplied by Dr. J. C. Cox. The type is in the Macleay Museum.

Genus PANDA Albers.

Man. Conch. ix, p. 163; viii, p. 293; vi, p. 74.

The amplification of the limits of this genus by Mr. Hedley and myself, renders further treatment of the group necessary, to find place for the Bulimoid forms.

P. FALCONERI ('Reeve' Gray). Vol. vi, p. 75.

Helicophanta falconeri Reeve MSS., GRAY, P. Z. S., 1834, p. 63. —*Helix falconari* REEVE, Conch. Syst. ii, p. 69 (1842).

P. maconelli Reeve (Vol. vi, p. 76) is considered a variety of *falconeri* by Hedley, who has illustrated the connecting links (Rec. Austr. Mus. ii, p. 30, pl. 4, 1892). Dr. Cox has illustrated the living animal of *maconelli*, Proc. Linn. Soc. N. S. Wales, (2), vi, p. 570, pl. 20, fig. 1.

See vol. viii, p. 293 for other varieties of this species.

P. ATOMATA (Gray). Pl. 5, figs. 81, 82.

Shell imperforate, oblong-conic, rather thin but solid. Yellow with fine, crowded, interrupted or waved reddish lines, and usually some more conspicuous blotches, rarely uniform reddish. Surface smoothish, somewhat shining, sculptured with slight growth-wrinkles and very fine, close, undulating spiral striæ. Apex obtuse; nearly two nepionic whorls with close spiral series of small granules. Whorls 5 to 6, convex, the last oblong.

Aperture ovate, purplish, fleshy or bluish tinted within with some pearly luster; but slightly oblique; outer lip simple and blunt; columella subvertical, a little arcuate, reflexed and adnate above.

Alt. 58, diam. 29, longest axis of aperture 32 mill.

Alt. 44, diam. 23, longest axis of aperture 25.5 mill.

New South Wales, Australia: *Near Scone* (Cox, Hedley); *70 miles from Port Macquarie* (Cunningham); *Ash Island and Hexham, Hunter River* (Scott); *Port Stephens; Manning River* (King).

Bulimus atomatus GRAY, P. Z. S., 1834, p. 64.—REEVE, Conch. Icon., pl. 30, f. 184.—PFR., Monogr. ii, p. 171; iii, 407; iv, 467; vi, 108; viii, 145.—COX, Mon. Austr. L. S. Sh., p. 71, pl. 13, f. 8; pl. 18, f. 15.—*Panda atomata* HEDLEY, Abstract Proc. Linn. Soc. N. S. Wales, April, 1892.—PILSBRY, Nautilus vi, p. 9 (1892).—HEDLEY, Rec. Austr. Mus. ii, p. 26, pl. 5, f. 10 (apical sculpture), 11 (jaw), 13 (genitalia); pl. 6, f. 14, 15 (teeth).—PILSBRY, Man. Conch. (2), ix, p. 164.

P. atomata is variable in coloring, the dark blotches conspicuous on some shells being almost or quite absent on others; and sometimes a sombre chestnut tint obscures the finer markings. There is also a clear yellow form lacking the chestnut lines (v. *azonata*), and a nearly uniform tawny-chestnut or "rich olive-brown" form, in which the chestnut pigment is generally diffused over the shell, not segregated in lines and blotches (v. *ponsonbii*).

Var. KERSHAWI (Brazier). Pl. 5, fig. 84.

"Shell imperforate, ovate, thin, diaphanous, shining, dark yellowish brown, marked with numerous longitudinal and irregular dark yellow and brown lines, some broad and some very narrow, rather running one into the other; and under the lens are to be seen longitudinal and transverse small granulations; spire moderately conical, rather obtuse at the apex; suture crenulated; whorls 5, convex, the last inflated, equaling more than one-half of the length of the whole shell; aperture broadly ovate, interior bluish-white; peristome simple, acute, straight, thin, the anterior and outer margins arched; columella straight, nearly vertical above, slightly expanded and reflected, with a thin deposit of callus on the columellar side and joined at the upper part of the peristome. Length 2, breadth $1\frac{1}{8}$, alt. 1; aperture $1\frac{1}{4}$ long, breadth $\frac{5}{8}$ inch." (*Brazier.*)

Snowy River, Gipps Land, Victoria (Mr. W. Kershaw).

Bulimus (*Liparus*) *kershawi* BRAZIER, P. Z. S., 1871, p. 641.—*Panda atomata var. kershawi* Braz., HEDLEY, Rec. Austr. Mus. ii, p. 29, 31, pl. 5, f. 9 (1892).

"This fine species I have named in honor of its discoverer, Mr. W. Kershaw, of Victoria, to whom I am indebted for a specimen. It approaches in appearance to *B. larreyi* Brazier, and *B. atomatus* Gray. It differs from those species in not having the dark spots and zigzag lines that are so characteristic in them." (*Braz.*)

Var. *elongata* Hedley. Pl. 5, fig. 82.

More elevated than the type, and represented by Mon. Austr. L. Shells, pl. 18, f. 15 (*Hedley, t. c.*, p. 31).

Var. *azonata* Hedley.

Bandless, entire shell straw-yellow colored (*Hedley*, l. c.). This seems to differ but little from the next variety.

Var. *ponsonbii* (Angas). Pl. 5, fig. 83.

"Shell imperforate, elongately ovate, solid, shining, everywhere marked with very fine decussated transverse striæ crossing the lines of growth, rich olive-brown without any markings, paler towards the apex; whorls 5, slightly convex; spire conical, blunt at the apex; aperture pale lilac within, longer than the spire, wider towards the base, outer lip simple; columella arcuate, the margins united by a strong spreading callus. Length 2 inches 2 lines, breadth, 1 inch." (*Angas.*) *Western Australia.*

Bulimus ponsonbii Angas, P. Z. S., 1877, p. 170, pl. 26, f. 1.—*Bulimus* (*Liparus*) *ponsonbii* Ang., Smith, Proc. Malac. Soc. i, p. 94.—*Conf.* Hedley, t. c., p. 260.

"This seems to have been hitherto overlooked by authors, or confounded in some unaccountable manner with the *Bulimus atomatus* of Gray, from New South Wales, from which it is altogether distinct. I found three examples in the British Museum labelled *B. atomatus* var., with a note on the back of the tablet stating that they were obtained by Mr. John Gould in Western Australia in 1839." (*Angas.*)

The imperforate axis, pale lilac color of the mouth, and the contour, all incline me to adopt Hedley's opinion that this is merely a form of *P. atomata*, and from New South Wales, not Western Australia. A specimen before me from Ash Island, N. S. W., agrees exactly with Angas' figure in color and form, entirely lacking the chestnut lineolation of the ordinary form.

P. larreyi (Brazier). Pl. 5, figs. 79, 80.

Shell imperforate, long-ovate, *thin;* pale yellowish or pale red, closely marked with fine, very short, irregular, obliquely descending lines or dots forming spiral zones alternating with bands of arrow-shaped or obliquely rhombic blackish-chestnut spots, the subsutural row squarish. Surface lusterless, faintly marked with growth-striæ. Spire short, conic, the apex very obtuse with sunken tip. Whorls

$3\frac{1}{2}$, the first keeled above, with concave crown, first $1\frac{1}{2}$ densely granose in spiral series, next half-whorl longitudinally striate, the striæ more or less granulous.

Aperture very large, ovate, showing the markings within; outer lip thin and simple; columella concave, thin, with a sharp, thread-like edge.

Alt. 24, diam. 14, longest axis of aperture 17 mill.

Alt. $28\frac{1}{2}$, diam. 18, longest axis of aperture 20 mill.

Bulimus larreyi Braz., P. Z. S., 1871, p. 321.—*Bulimina* (*Leparus*) *larreyi* Braz., Cox, Proc. Linn. Soc. N. S. Wales (2), ii, p. 1062, pl. 20, f. 1, 2 (1888).—*Panda larreyi* Braz., Hedley, Rec. Austr. Mus., ii, p. 29.—Pilsbry, Man. Conch. ix, p. 164, pl. 46, f. 13, 14 (after Cox).

Queensland, Australia: *Manarm Creek*, *Bellengen* (*Bellenger*) *River*, under burnt logs (King Larrey). Northern N. S. W.: *Clarence River* (Cox).

The specimen illustrated is not quite mature. Brazier's type measured one inch two lines long. I have lately received very beautiful specimens nearly 30 mill. long, from Dr. J. C. Cox, showing variation in the girdles of blackish spots. The surface in fresh specimens has a velvet-like appearance. Mr. Hedley writes: "I have lately seen an extensive series of *Panda larreyi*. It seems to constantly differ from *atomata* in the smaller size, narrower form and more vivid coloration. Its geographic range is different. Going north it immediately succeeds *atomata*, and inhabits the coastal area between the Hunter and the Clarence Rivers, N. S. W."

Named for a native chief.

Genus CARYODES Albers.

Manual, vol. ix, p. 161.

C. dufresnii (Leach). Pl. 5, figs. 85–93.

Shell imperforate, oval or oblong, solid; typically dull reddish-brown, paler on the spire, with *a peripheral pair of olive-yellow bands enclosing a dark girdle.* Surface varying from dull to glossy, *densely and minutely punctate* throughout (or with this sculpture obsolete on the last whorl or its lower half). Spire convexly conic, with extremely obtuse apex. Whorls $4\frac{1}{2}$ to $5\frac{1}{2}$.

Aperture slightly oblique, ovate, the columellar margin sinuous;

outer lip light edged, blunt and simple; columella vertical, expanded and adnate, white, subtruncate at its junction with the deeply arcuate basal lip.

Alt. 35, diam. 20, length of aperture 19 mill. (typical).

Alt. 45, diam. 24, length of aperture 23 mill.

Alt. 23, diam. 11, length of aperture 11.5 mill. (Cataract Hill).

Alt. 17. diam. 10.5, length of aperture 9 mill. (Georgetown).

Tasmania: *Hobart and Swansea*, on the East coast; *Bothwell*, about 50 miles N. of Hobart; *Ringarooma*, in the extreme N.-E.; *St. Leonards*, near Launceston, *Georgetown*, and *Pattersonia*, in the North; *Port Davey*, in the Southwest, and *Macquarie Harbor*, on the west coast. Probably inhabits the whole island.

Bulimus dufresnii Leach, Zoological Miscellany, ii, p. 154, pl. 120 (1815).—Chenu's reprint, Bibl. Conch., iii, p. 11, pl. 9, f. 7.—Desh., in Lam., An. s. Vert. viii, p. 246.—Pfr., Monogr. ii, p. 168; iii, 406; iv, 466; vi, 105; viii, 143.—Reeve, Conch. Icon. p. 37, f. 319.—Cox, Mon. Austr. Land Shells, p. 70, pl. 13, f. 12.—*Helix dufresnii* Fer., Prodr. p. 48; Histoire, pl. 113, f. 1, 2, 3.—Quoy & Gaimard, Zool. Voy. Astrolabe, ii, p. 118, pl. 10, f. 1–3.—Tenison-Woods, Proc. Linn. Soc. N. S. Wales, iii, p. 81, pl. 7 (variations of shell, etc.).—Hedley P. L. S. N. S. W. (2), vi, p. 19, pl. 3, f. 1 (living animal).—*Orthostylus dufresnii* Beck, Index Moll., p. 50.—*Bulimus* (*Caryodes*) *dufresnii* Albers, Die Hel., p. 141.—*Caryodes dufresnii* Frauenfeld, Verh. Zool.-bot. Ges. Wien, xix, 1869, p. 874.—Semper, Reisen in Archip. Phil., Landmoll., p. 103, pl. 12, f. 23–25, pl. 16, f. 7 (anatomy).—Hedley, Rec. Austr. Mus. ii, p. 29 (1892).—Pilsbry, Man. Conch. ix, p. 162, pl. 46, f. 15 (living animal, after Hedley), f. 16 (shell), pl. 42, f. 41–46, pl. 49, f. 24 (anatomy).—*Placostylus* (*Caryodes*) *dufresnii* H. & A. Adams, Gen. Rec. Moll. ii, p. 154.—*P.* (*Cariodes*) *dufresnii* Tap.-Can., Viaggio "Magenta," p. 86.

While strongly individualized, this species varies excessively in contour, color and sculpture. Fig. 91 represents a typical specimen, exact locality unknown. Fig. 16, of pl. 46, vol. ix, is another from the same lot. The ground color is chestnut, punctation strongly developed. Fig. 90 is more olivaceous-chestnut, and the largest shell I have seen. Fig. 87 is a small blackish form. Fig. 86 is a small dark form with scarcely any micro-sculpture, from Georgetown. Fig. 88 is three banded, olivaceous-brown and densely punctate

above, yellow and smooth below. Pattersonia. Fig. 85 is clear greenish-yellow with a single dark belt; sculpture faint. Cataract Hill. Fig. 92 is a very long shell from Port Davey, on the extreme southwest of the island (Tenison-Woods). Figs. 89, 93 are extreme forms from Ringarooma (Tenison-Woods).

It is extremely probable that a number of distinguishable local races exist, but they should be studied by some one familiar with the local conditions, and with ample geographic series.

Genus AMPHIDROMUS Albers, 1850.

Amphidromus Albers, Die Hel. 1850, p. 138 (in part).—Martens in Die Hel. 1860, p. 184, type *B. perversus* Linn.; Ostas. Zool., Landschn., p. 332.—Semper, Reisen, p. 146.—Fulton, Ann. and Mag. of Nat. Hist. (6), xvii, pp. 66–94.

Shell of moderate size, dextral or sinistral, long-ovate, with 6–8 moderately convex whorls; smooth (rarely ribbed) and light or bright-colored, yellow predominating, often with green or brown streaks, flames or bands. Apical whorls smooth or obsoletely pitted. Aperture somewhat oblique, ovate, not contracted by teeth or folds; peristome more or less thickened, expanded or reflexed, the columellar margin reflexed, with a very weak fold or none.

Jaw thin and weak, with flat ribs crenulating the edges. Radula with broadly V-shaped rows, the teeth of "arboreal" type, with the side cusps brought near the median cusp, all the cusps broad; outwardly the side cusps are split. Kidney extremely long and narrow, with reflexed ureter and closed secondary ureter. Genitalia of typically epiphallogonous structure; receptaculum seminis on a long, simple duct; penis short, with the retractor muscle inserted low, and ending in a flagellum and the vas deferens. Nervous and retractor systems Helicine.

Type *Helix perversa* L. Distribution, Sylhet Hills and Indo-China to Timor, east to Mindanao and possibly the Moluccas.

Without ample illustration the internal anatomy cannot be fully discussed; but from the data supplied by Semper, Wiegmann and Jacobi, it is clear to me that the genus does not belong to the *Bulimulidæ* but to that group of *Helicidæ* called *Ephiphallogona*, of which the genera *Chloritis*, *Obba*, *Planispira* and *Papuina* are leading members. The exact inter-relationships of the genera of this group require further elucidation. We know that *Planispira*, *Chloritis* and *Thersites*

are very closely allied, in fact, not everywhere clearly differentiated, and *Xanthomelon* and *Albersia* seem also to be near them. *Camæna* and *Obba* form another group within the subfamily, while *Ganesella*, *Papuina* and *Amphidromus*, the latter two arboreal, stand somewhat isolated. In the angulated rows of teeth and their broad cusps, *Amphidromus* approaches *Papuina* and *Polymita*. Whether these features are purely adaptive or indicate a relationship with the former genus, remains to be seen.

In most of the species of *Amphidromus* the nepionic shell appears quite smooth; but in a number of the smaller sinistral forms, such as the *A. sylheticus* group, some sparse, elongate, shallow pits or punctures may be seen.

While *Amphidromus* had formed the subject of special studies by Pfeiffer and Mousson, it was Professor E. von Martens who produced the first essay of marked ability. In his volume on the land snails of the "Prussian Expedition to East Asia" (1867, pp. 77 and 332), the general characteristics of the group are discussed, and a large number of species reviewed with masterly grasp of the subject. This sound and sane work of the Berlin savant remains to-day undiminished in value.

In the "Annals and Magazine of Natural History" for January, 1896, Mr. Hugh Fulton published "A list of the species of *Amphidromus* Alb., with critical notes and descriptions of some hitherto undescribed species and varieties" (pp. 66–94, pl. v, vi, vii), in which the sixty-four known species are classified in some nineteen "groups," with many useful notes, descriptions and figures of species and varieties not before illustrated, among them the types of Pfeiffer's unfigured species. This catalogue is a work of great practical utility and has been very serviceable to subsequent investigators.

The variability of species of *Amphidromus* has been discussed by von Martens, whose observations go so directly to the point that I partially transcribe them in the two paragraphs following.

The group owes its name (*Amphidromus*, running both ways) to the peculiar circumstance that several species occur either dextral or sinistral, with equal frequency; others are sinistral only, still others dextral; so that the difference in direction of the coil, which usually is characteristic of whole genera, or appears as a rare monstrosity in a species, sinks here to sometimes only an individual characteristic, sometimes merely specific.

To distinguish species in this group is a difficult matter, largely dependent upon subjective considerations. What one would hold to be merely an individual variation, sometimes proves, with more ample knowledge, to be a species, well defined geographically; and what one might think from a single example to be a sharply-characterized species, may appear, when it comes to be collected on the spot, to be merely the extreme of an uninterrupted series of individual variations, living together, as in the forms of *A. interruptus*. Form, markings and tint of the ground-color may be constant in all specimens from one locality, or they may vary. Thus, form and markings vary in the specimens of *A. interruptus* from Maros, but the ground-color remains the same; but in *A. purus* from Bandjar, Java, the ground-color varies. Only series of specimens from known localities can permit conclusive opinions.

An analogous case is found in the American genus *Liguus*, where coloration is equally variable. To some extent certain patterns characterize local colonies; and frequently the same pattern occurs in several, probably many, separated localities. Thus, near Miami, Florida, I found only green-striped specimens in one wood, while in another, a half mile distant, many of the shells had broad brown markings. To some extent the patterns are racial in some cases, but these races are of but slight value, being analogous to the slight characteristics common to human families of common parentage.

Of course in some species of *Amphidromus*, special color patterns seem to be characteristic; but even in these, a wide variation may be expected, when districts other than the type locality come to be searched. Under these circumstances it is almost impossible to construct satisfactory keys for the ready identification of species.

Amphidromus was divided by von Martens into two groups: (1) rather large and broad species, as a general rule indifferently dextral or sinistral, and usually having varices, or periods of growth-arrest marked by the deposition of an oblique pigmented stripe, and (2) smaller and more slender forms, always sinistral, and without varices. This is doubtless a natural division, though not indicated by any considerable difference in the soft anatomy so far as known. Further subdivision is largely a matter of opinion, and must be expected to vary as the relationships of particular species become more definitely appreciated. I have grouped the species into 20 groups, in part

agreeing with those of Fulton. If the present groups are more natural than his, it must be due to my having his work as a basis.

I. Amphidrome Division.

Shell rather stout in figure, either dextral or sinistral, usually solid, and with periodical color-stripes or "varices."

Species of this division do not invade the island chain lying east of Java, but extend east to Celebes and Mindanao, and north into Anam and Burma. Species of the Second Division extend further north and southeast, but do not reach so far into the Philippines.

Key to Groups.

a. Peristome white or nearly so.
  b. Surface costulate or strongly striate.
    c. Form stout, compact; Java.
      Group of A. javanicus, No. II.
    c^1. Form slender, diam. less than half the alt. Celebes.
      Group of A. beccarii, No. III.
  b^1. Surface smooth or nearly so (rarely with spiral welts, or a projecting varix).
    c. Umbilicate, large, early whorls dark-margined. Mindanao, Leyte. *Group of A. maculiferus*, No. I.
    c^1. Imperforate or rimate, uniform yellow or white, or variously marked.
      d. Plain, streaked or striped species of the Philippines, Borneo, Celebes and Java.
        Group of A. perversus, No. IV.
      d^1. Similar or rarely banded species from north of Sunda Strait, *Group of A. aureus*, No. V.
      d^2. Spirally zoned species.
        Group of A. janus, No. VI.
a^1. Peristome colored, usually purple or rose.
  Group of A. schomburgki, No. VII.

I. *Group of A. maculiferus.*

A. maculiferus (Sowerby). Pl. 49, figs. 19, 20, 21.

Shell generally sinistral, narrowly umbilicate, oblong-conic, moderately solid, glossy, variable in color, but typically grayish-brown, shading to white just below the suture, irregularly streaked with dull

purple and more or less dappled with white and dull purple by dislocation of the streaks, which on the median whorls of the spire are typically zigzag, but often straight; the apical whorls white or with a blue-black band above the suture. Whorls $6\frac{1}{2}$, *convex*. Aperture oblique, the streaks or spots showing darkly through; peristome white or creamy, expanded and reflexed, thickened and slightly recurved at the edge; columella heavy, straight, its edge broadly dilated above, nearly covering the umbilicus; parietal callus thin, whitish-transparent.

Alt. 62, diam. 28 mill. (Sowerby's figure).

Alt. 57, diam. 28, longest axis of aperture 28 mill.

Alt. 60, diam. 31, longest axis of aperture 31 mill.

Mindanao: *province of Misamis*, on trunks of trees (Cuming, Semper).

Bulimus maculiferus SOWERBY, Conch. Illustr., p. 8, fig. 100 (1841)—BRODERIP, P. Z. S., for 1841, p. 14 (Sept., 1841).—*Bulimus perversus e* PFR., Monogr. ii, p. 38.—*B. maculiferus* Sowb., REEVE, Conch. Icon. pl. 6, f. 26.—PFR., Zeitschr. f. Malak., 1849, p. 134; Conchyl. Cab. p. 117, pl. 36, f. 1, 2; Monogr. iii, p. 319; iv, p. 381; vi, p. 25; viii, p. 39.—*Amphidromus maculiferus* SEMPER, Reisen im Archip. Phil., iii, p. 146, 148, pl. 14, f. 1 (genitalia).—FULTON, Ann. Mag. N. H. (6), xvii, p. 74.—MOELLENDORFF, Abhandl. Naturforsch. Ges. Görlitz, xxii, 1898, p. 149.—HIDALGO, Obras Malacologicas, in Mem. Real Acad. Ciencias, xiv, pl. 100, f. 1–6.

The original figures, like Hidalgo's f. 5, 6, show a distinctly spotted form (fig. 19), with rather faint streaks, but the ordinary specimens are rather profusely streaked with purplish-brown and less spotted, as in fig. 21, or the figures of Reeve (fig. 20) and Pfeiffer, and Hidalgo's figs. 1–4.

Var. OBSCURUS Fulton.

"In form like typical *maculiferus*, but of a dirty white color, obliquely striped and sparsely spotted with faint reddish-brown. Apical whorls filleted as in *strigata*." Occurs *both dextral and sinistral.* *Mindanao.*

B. maculiferus var. *g*, PFR., Monogr. iii, p. 319.—*A. m.* var. *obscura* FULTON, t. c., p. 75.

Subsp. MULTICOLOR v. Moellendorff.

Smaller; yellowish with streaks of light red, brown and greenish, usually flammulate.

Leyte: *Maasin* (Semper) *and Bato* (Koch, Quadras). Camotes (Koch).

A. maculiferus var. multicolor v. Moell., Bericht Senckenbergische naturforschende Gesellschaft, 1893, p.99.—*A. maculiferus, Exemplare von Maasin*, Semper, t. c., p. 149.

Subsp. gracilior Fulton. Pl. 49, fig. 22.

Elongated; white with horn-colored streaks, the base often faintly yellowish; apical whorls white with black or gray band above the suture; lower half of the last whorl strongly striate.

Alt. 70, diam. 33, longest axis of aperture 35 mill.

Alt. 52, diam. 26, longest axis of aperture 27 mill.

Mindanao (eastern): *valley of the Agusan River; Pasian Mts.* (Semper); *Davao* (Quadras).

B. maculiferus var. b, Pfr., Monogr. iii, p. 319; Conchyl. Cab. pl. 40, f. 9.—*A. maculiferus* var. *gracilior*, Pfr., Fulton, t. c., p. 74, 1896. *A. maculiferus*, var. *strigata* Möllff. MSS., Fulton, t. c., p. 75.—v. Malldff., Abhandl. Nat. Ges., Görlitz, xxii, 1898, p. 149. —*A. nigrofilosus* Rochebr., Hidalgo, Obras Malac., in Mem. Real Acad. Ciencias, xiv, pl. 101, f. 1–4 (good!).

Var. *strigata* is described as "like *gracilior*, except that the ground color is light reddish brown, with oblique stripes of the same color, only darker." The two names are of even date, but *gracilior* has precedence of one page, and has been figured, so that it should be retained, both on the ground of priority and of better definition. There are transitions between the brown-streaked and the corneous-streaked forms in the series before me, and von Möllendorff has already united them. One specimen shows a dark purple varix on the penultimate whorl, lacking on all other *maculiferus* I have seen. Semper mentions a similar specimen from the Rio Agusan. Semper took specimens at Batuanan, Bohol, somewhat smaller than those from Mindanao, 55–60 mill. long; the apical whorls were either white or banded with blue-gray.

The *A. nigrofilosus* of Rochebrune, described as from Cambodia, is said to be identical with this variety. If so, the name will take precedence. I have thought it best to insert the description of that form among the Cambodian species, pending positive information upon its identity. Dr. Hidalgo separates *gracilior* from *maculiferus* as a species, under the name *nigrofilosus*, on his plates, but I have not yet seen the text, which may clear up the uncertainty.

Subsp. INFLATUS Fulton. Pl. 49, figs. 25, 26, 27.

Large and *ventricose*, with shortly conic spire and inflated body-whorl. Surface glossy, striatulate and spirally striate. *Yellow or fleshy yellow*, with a pale or white band below the suture often faintly brown-spotted, and with some faint light and dark streaks, the apex white with a black or gray band; *back of the peristome orange.* No varices. Aperture large, pale yellow within; peristome white or flesh-tinted, the inner border of the outer lip and the columella generally reddish; broadly reflexed and *strongly recurved*,

Alt. 66, diam. 38 mill. (type).

Alt. 62, diam. 35, longest axis of aperture 35 mill.

Alt. 64, diam. $32\frac{1}{2}$, longest axis of aperture 36 mill.

Alt. 54, diam. 30, longest axis of aperture $32\frac{1}{2}$ mill.

A. maculiferus var. *g*, HIDALGO, Journ. de Conchyl. 1888, p. 31, pl. 6, f. 1; Obras Malacológicas, pl. 99, f. 1, 2.—*A. m.* var. *inflata* FULTON, t. c., p. 75 (1896).

Reported merely from the Philippines by Hidalgo on the authority of Baranda, and so far no definite locality is known, those before me collected by Steere and others bearing the same indefinite label. It is quite a distinct race, though varying widely in size, proportions and solidity.

2. *Group of A. javanicus.*

Large species with coarse wrinkle-striation and usually open umbilicus, the lip reflexed and narrowly recurved at the edge, but never in the least adnate on the back. Either dextral or sinistral.

The forms vary a good deal, and may eventually all be reduced to subspecies of two or three species.

a. Lip flatly reflexed, wide, broader at base. *inauris*, p. 138.

a[1]. Lip normal, reflexed, and recurved at the edge.

b. Shell conspicuously streaked.
javanicus, p. 140; *heerianus*, p. 138.

b[1]. Shell spirally banded. *robustus*, p. 139.

b[2]. Shell unicolored or with one or two varices.

c. Pale yellow, no varices; much inflated, the spire short.
teysmanni, p. 134.

c[1]. Pale yellow, no varices; a white, crenate band at the appressed suture; long-conic, solid. *appressus*, p. 136.

c^2. Pale yellow, tawny or white, usually one varix; flatly striate. *palaceus*, p. 134.

c^3. Strongly wrinkle-striate and plicate. *winteri*, p. 137.

A. TEYSMANNI ('Mousson' Pfr.). Pl. 47, figs. 8, 9.

Shell nearly covered-perforate, ovate-conic, *ventricose, short, rather thin;* irregularly wrinkle-striate, seen under the lens to be sculptured with close, obsolete spiral striæ; sulphur yellow and rather glossy above, whitish below the middle. Spire broadly conic, the vertex minute, rather acute; suture a trifle marginate. Whorls 6, a little convex, *wanting varices*, the last rather inflated, about as long as the spire, rounded below. Aperture a little oblique, truncate-oblong or somewhat rhombic oval, white and glossy inside; peristome white, callousod, rather widely expanded and delicately recurved, the margins joined by a white entering callus; columellar margin vaulted, reflexed, dilated, more or less covering the narrow umbilicus (*Pfr.*). Length 46, diam. 30, or length 56, diam. 32 mill.

Moluccas (?) Teysmann, in coll. Mousson.

Bulimus teysmanni Mouss., MSS. PFR., Novit. Conch. iv, p. 32, pl. 116, f. 2, 3 (1871); Monogr. viii, p. 40. *Cf.* Martens, Malak. Bl., 1873, xx, p. 154.—*A. teynsmanni* (*sic*) FULTON, t. c., p. 73.

Allied to *A. palaceus* and *A. winteri*, but thin, more globose, with short spire. Only the types are known. Von Martens considers it a variety of *winteri*.

A. PALACEUS ('v. d. Busch' Mousson). Pl. 47, figs. 1, 2, 4, 5, 6.

Shell oblong-ovate, perforate, transversely [in the direction of growth-lines] *strongly striate*, glossy, yellow or buff-tawny, the apex a little obtuse, white; suture subcrenulated, white-margined. Whorls 7, a little convex, the last as long as the spire, somewhat inflated, the penultimate ornamented with a transverse brown band [varix]. Aperture ovate; columella straight, subinflated; peristome white, reflexed, thickened, the columellar margin expanded, parietal margin white-calloused. (*Mousson.*)

Alt. 53, diam. 30 mill. (*Mouss.*).

Java: *Pardana and Tijkoya*, in coffee plantations (Zollinger; Mousson types); *Palabuan* (v. Martens).

Bulimus palaceus v. d. Busch MS., MOUSSON, Land- und Süsswasser-Moll. Java, pp. 28, 108, pl. 3, f. 1 (1849).—PFR., Zeitschr. f. Malak.,

1849, p. 136; Conchyl. Cab., p. 134, pl. 40, f. 6, and var., f. 5, 7, 8: Monogr. iii, p. 320.—Martens, Ostas. Landschn., p. 352 (exclusive of syn. *B. mundus*).—*B. perversus* var. *i*, Pfr., Monogr. ii, p. 39.—*Amphidromus palaceus* Fulton, Ann. Mag. N. H. (6), xvii, p. 72, with var. *subaurantia*, *appressa* and *pura*.

The coarse striation and non-appressed outer lip readily separate this species from *A. perversus* and its allies. It differs from *A. winteri* in the flatter striæ, less roughened and more glossy surface, etc., but these species approach one another very closely.

The color varies from sulphur or citron-yellow of the type (pl. 47, figs. 1, 2) to somewhat orange-colored or pale salmon-pink with a reddish peripheral band (pl. 47, figs. 4, 5); the latter being the var. *subaurantia* of Fulton, which he incorrectly credits to von Martens. Some specimens quite bridge over the gap to var. *purus*, and it is not easy to tell which they are nearest to.

In figures 13, 14 of pl. 46, two specimens (Clapp coll.) are illustrated showing variations. Fig. 13 is lemon yellow with white sutural border, a chestnut varix on the penult. whorl, and a pale reddish line below the suture on the fourth whorl. Fig. 14 is pale cream color with white suture, a purple-black varix on the last whorl, and a dark subsutural band on several early whorls.

White, sulphur-yellow and light reddish-brown specimens were collected together, by G. Schneider, upon the island Nusa Gembangan (also written Kembangan and Kambangan), on the south coast of middle Java. (*Martens*, Nachbl., 1900, 17.)

Var. *purus* Mousson. Pl. 47, fig. 3.

Solid, narrowly umbilicate or subperforate, glossy, *white, faintly yellow-tinted or roseate*, strongly and irregularly striate; whorls $6\frac{1}{2}$–$7\frac{1}{2}$; *peristome broadly expanded, especially the columellar margin;* a brown varix on the ventral face of the last whorl, or on the preceding whorl. Alt. $54\frac{1}{2}$, diam. $28\frac{1}{2}$ mill.; alt. 49, diam. 26 mill.

Java: *Hakka, prov. Probolingo; Pardana* (Zollinger).

B. purus Mouss., Moll. Java, p. 29, pl. 3, f. 2.—Pfr., Monogr. viii, p. 41; Novit. Conch. iv, p. 33, pl. 116, f. 6.—*B. palaceus* var. *b*, Pfr., Zeitschr. f. Malak., 1849, p. 136; Monogr. iii, p. 320.—*A. palaceus* v. *pura* Fulton, t. c., p. 73.

In some specimens the brown varix is wanting, moved back upon the penultimate whorl, or vestigial; and in one before me from the

collection of G. H. Clapp, a couple of brown stripes precede the varix stripe. The size varies within wide limits, some being as small as 43 mill. long.

Var. *appressus* ('Mousson' Martens). Pl. 47, fig. 7; pl. 46, fig. 15.

Shell dextral [or sinistral], nearly covered perforate, *conic-elongate*, solid, closely, regularly and delicately striate, glossy, pale isabelline, whitish above, *lacking varices*. Spire long, almost regularly conical, the apex rather acute, buff; *suture appressed, white, more distinctly striate*. Whorls 7 to $7\frac{1}{2}$, a trifle convex, the last two-fifths the total length, not inflated, rounded basally. Aperture rather oblique, oblong-semi-elliptical, whitish and glossy within; peristome callous, white, broadly expanded and narrowly revolute, the margins joined by a rather thick milk-white callus; right margin regularly and slightly arched, columellar margin slightly receding, somewhat twisted and very much dilated above, almost appressed, nearly closing the narrow umbilicus. Length 50–54, diam. 23 mill. (*Pfr.*).

Java (Zollinger); *at Gunung Gedeh* (Strubell).

Bulimus appressus Mousson in coll., Martens, Ostas. Landschn. p. 353 (1867).—Pfr., Monogr. vi, p. 26 (quoting v. Mart.); Novit. Conch. iv, p. 34, pl. 116, f. 4, 5; Monogr. viii, p. 41.—*Amphidromus appressus* (v. Mts.) Boettger, Bericht Senck. naturforsch. Ges. in Frankfurt a. M., 1890, p. 145, pl. 5, f. 8.—*A. palaceus* var. *appressa* (Mouss.) Pfr., Fulton, Ann. Mag. N. H. (6), xvii, p. 72.

The type was dextral (pl. 47, fig. 7), but Boettger figures a sinistral example from Gunung Gedeh (pl. 46, fig. 15), of a pale sulphur color. I have not seen the species, which may well prove to be, as Mr. Fulton holds, a small-mouthed, elongate variety or subspecies of *A. palaceus*.

Subsp. tener Martens.

A delicate, thin shell, with the last whorl comparatively large; pale brimstone yellow. Alt. 46, diam. 28, aperture $25\frac{1}{2}$ mill. (*Martens*). Both sinistral and dextral.

Bulimus perversus tener Martens, Ostas. Landschn., p. 350.—??*Bulimus aureus* Swains., Zool. Illustr. i, pl. 47, upper and lower figures.

I refer to this form, which was described as a variety of *perversus*, a series of shells (pl. 46, figs. 16, 17, 18) from Java which are thinner and far paler than *A. perversus*, whitish toward the apex and

below the sutures, imperforate, and with the last whorl more or less swollen. They are brilliantly glossy, and show faint traces of the sculpture of *A. palaceus*, *purus* or *appressus*, though this is scarcely noticeable unless looked for. The degree of inflation is variable. *Aperture pale yellow within*, not white, as in *perversus*, and the spire is distinctly attenuated near the apex.

A. WINTERI (Pfeiffer). Pl. 48, figs. 13. 14, 15.

Shell either sinistral or dextral, *openly perforate*, ovate-conic, rather ventricose, solid, hardly shining, *strongly and irregularly wrinkle-striate*, and typically *plicate*, *the folds wave-like*, irregular, and obsolete below the periphery; white, pale straw- or sulphur-tinted or pale rufous, usually unicolored but sometimes streaked. Whorls 6–7, moderately convex. Aperture slightly oblique, whitish or pale yellow within; peristome white, reflexed and recurved at the edge; columella thick, vertical; parietal callus white.

Alt. 56, diam. 30 mill. (Pfr's type, figs. 13, 14).

Alt. 47, diam. 26, longest axis of aperture 26½ mill.

Alt. 43, diam. 22, longest axis of aperture 24 mill.

Java (Winter); *Tjikoya*, *Pardana* and *Hakke*, in the assistant-residency Probolingo (Zollinger); *Tjisurupan* (Martens); *Bandjar*, in Banjumas (F. Jagor).

Bulimus winteri PFR., Zeitschr. f. Malak., 1849, p. 135; Conchyl. Cab., p. 134, pl. 40, f. 3, 4; Monogr. iii, p. 319; iv, 382; vi, 25.—MARTENS, Ostas. Landschn., p. 353, pl. 20, f. 4, 10 (var.), pl. 21, f. 12 (young).—*Amphidromus winteri* FULTON, t. c., p. 74.—*A. winberi* Pfr., Nevill, Handl. Moll. Ind. Mus., i. p. 126.—*Bulimus mycrostoma* HASSELT, Algemene Konst en Letterbode, 1823; Bull. des Sci. Nat. et de Géol. (2 sect.), iii, 1824, p. 83, and an unpublished plate in Berl. Mus. 13, f. 2, according to von Martens.

Typical *winteri* is very strongly sculptured with deeply-cut wrinkle-striæ and coarse, wave-like folds, and is of a uniform pale color; but the variations apparently include forms hardly more striate than *A. javanicus*, and without undulations. The material before me consists of several extreme forms only, from which an independent judgment cannot be formed; but I am disposed to agree with von Martens, who claims that these several forms being united by intermediate examples, do not admit of specific discrimination. In a lot of 20 specimens from one locality, collected by Jagor, he found 11 white, 4 dextral and 7 sinistral.

2 pale yellow, 1 dextral and 1 sinistral.

6 reddish, 1 dextral and 5 sinistral.

1 banded, 0 dextral and 1 sinistral ("*robustus*" Fulton).

The yellow ones are uniform colored, the white show traces of streaks, the reddish have numerous decidedly-pronounced narrow streaks of slightly darker, reddish-brown color; and one specimen (pl. 46, fig. 21) shows four sharply-defined and rather wide pale-reddish spiral bands upon a white ground (this being Fulton's *A. robustus*, see below); the variceal streaks are sometimes blackish-brown, sometimes lighter brown. Transitions between those with more evenly and those with more irregularly folded sculpture exist, so that no division into two sets by this character can be made.

If von Martens was right in referring the specimens commented on above to the one species *winteri*, we can scarcely allow that *A. heerianus* and *A. robustus* are specifically distinct.

B. junghuhni is a museum name pertaining to this species, according to von Martens.

Subsp. *inauris* 'Bttg.' Fulton. Pl. 48, figs. 16, 17, 18.

Umbilicate, oblong, wrinkle-striate or costulate and sometimes malleate, pale sulphur-tinted or lemon, uniform, or yellow with reddish streaks, the darker color sometimes predominating. *Peristome flatly reflexed or recurved, broad, wider below.*

Java (Fruhstorfer).

A. winteri var. *inauris* Bttg. MSS., Fulton, Ann. Mag. N. H. (6), xvii, p. 74 (1896).—*B. winteri* var. *b*, Pfr., Monogr. iv, p. 382 (1859).

Varies a good deal in form, color and sculpture, and occurs both sinistral and dextral.

A. heerianus ('Mousson' Pfeiffer). Pl. 48, fig. 10 (type), figs. 11, 12.

Perforate, ovate-conic, rather thin, rudely striate and sculptured with very fine and close spiral striæ; pale tawny-whitish, densely streaked with cinnamon; but slightly shining. Spire broadly conic, the apex rather acute, suture superficial, somewhat hair-margined. Whorls 6, a little convex, the last more swollen, a little shorter than the spire, with a narrow white umbilical patch. Aperture slightly oblique, somewhat rhombic-oval, white and glossy inside; peristome rather broadly expanded and narrowly recurved, white, the margins

joined by an entering milk-white callus; columellar margin dilated, reflexed, alt. 43–53, diam. 24–28 mill. (*Pfr.*).

Bulimus heerianus Mouss. MSS., Pfr., Novit. Conch. iv, p. 31, pl. 116, f. 4 (1871); Monogr. viii, p. 40. *Conf.* v. Mart., Malak. Bl. xx, 1873, p. 154.—*A. heerianus* Fulton, *t. c.* p. 73.

The reddish specimens of *winteri* reported upon by von Martens, from Bandjar, Java, apparently belong to this race; and I refer here also a pink specimen with some yellow streaks, purple-black varices, pale spire and yellow apical whorls (pl. 48, figs. 11, 12). Fulton remarks as follows: "The color of this species varies from yellow with only two or three reddish-brown stripes to specimens that are almost covered with variegated green and red-brown oblique markings. The spiral lines, as seen in the type specimen, are in most specimens not so distinct, but traces of them can be found in nearly all. This species has been distributed under the manuscript names of *Prillwitzi* and *pœcilus*, both of Boettger."

A specimen from coll. G. H. Clapp (pl. 46, figs. 19, 20) is yellow on the spire, becoming obscure olive with some purplish streaks on the last whorl, and with the umbilical area and a sutural zone pale yellow; there are also faint traces in places of several light bands. The penultimate whorl has a dark varix and some brownish streaks. Spiral striæ distinct in places. This specimen is referable to Boettger's unpublished variety *pœcilus*, and establishes a transition toward *A. robustus*.

A. heerianus seems closely allied to both *palaceus* and *winteri*, and specimens probably occur uniting the three.

Var. *robustus* Fulton. Pl. 46, fig. 21.

"Shell sinistral, ovate-conic, solid, obliquely striate, almost imperforate, white, with two brown spiral bands commencing at third whorl, above and below the suture, and continued to last whorl, which has in addition one, and sometimes two other bands on its lower half; whorls 7, convex; lip and columella white, expanded, margins joined by a white callus. Long. 50 mill., maj. diam. 31 mill." (*Fulton*). *Bandjar, Java.*

B. winteri, gebändert, Martens, Ostas. Zool., Landschn. p. 354, pl. 20, f. 4.—*A. robustus* Fulton, Ann. Mag. N. H. (6), xvii, p. 73 (1896).

This is the form von Martens considered an individual variation of *A. winteri*. I have not seen specimens.

A. JAVANICUS (Sowerby). Pl. 61, figs. 50, 51.

Shell either sinistral or dextral, imperforate or nearly so, solid, ovate-pyramidal, *closely streaked* with dull crimson, chestnut and blackish on an olivaceous buff, ochre-tinted or livid ground, the streaks often broken into a mottled pattern; early whorls and a border below sutures white, pink or pale; several blackish varices followed by whitish streaks generally present, but inconspicuous in the general strigation. Surface glossy, *distinctly striate.* Spire rather straightly conic; whorls $6\frac{1}{2}$–$7\frac{1}{2}$, slightly and equally convex, separated by moderately impressed sutures marked with a white hair-line. Aperture but slightly oblique, ovate, bluish inside; peristome white, expanded, subreflexed, blunt at the edge; columella nearly straight; parietal callus white, deeply entering.

Alt. 50, diam. $26\frac{1}{2}$, longest axis of aperture $26\frac{1}{2}$ mill. (dextral).

Alt. 52, diam. 26, longest axis of aperture $26\frac{1}{2}$ mill. (sinistral).

Alt. 62, diam. 31, longest axis of aperture 32 mill. (sinistral).

Java: *near Palabuan*, in the southwest (Prof. E. v. Martens).

Bulimus javanicus SOWB., Conch. Illustr., *Bulimus* p. 6, fig. 35, 35* (1841).—*Amphidromus javanicus* Sowb., FULTON, Ann. Mag. N. H. (6), xvii, 1896, p. 73.—*Bulimus loricatus* PFR., P. Z. S., 1854, p. 293; Monogr., iv, 372; vi, 16.—MARTENS, Ostas. Landschn., p. 339, pl. 22, f. 2.

The much and evenly streaked and often in places mottled color-pattern, distinguishes this from other striate Javan species, while the streaked forms of *A. interruptus*, *inversus*, etc., are distinctly smoother. Sowerby did not describe *javanicus*, but his illustration is characteristic, the locality Java being given. No locality for *loricatus* Pfr. was known until Dr. von Martens found it near Palabuan.

3. *Group of A. beccarii.*

A. BECCARII (Tapparone Canefri). Pl. 68, figs. 21, 22

Shell compressed-subumbilicate, fusiform-oblong, sinistral, *longitudinally obliquely wrinkle-plicate*, rather glossy, whitish-buff. Spire elevated-conic, the upper whorls more or less maculated with brownish, apex rather acute. Whorls 6, a little convex, separated by an oblique, appressed and submarginate suture, the last whorl large, rather convex, somewhat tapering below. Aperture ovate-oblong, nearly vertical, as long as the spire, whitish in the throat; peristome

white, the margins joined by a very thin parietal callus, the outer and basal margins expanded and reflexed, columellar margin dilated, nearly straight, nearly forming an angle with the basal margin. Length 43, width 19, alt. of aperture 22 mill. (*T. C.*)

Celebes: *Kandari*, on the southeast peninsula. (Beccari.)

Bulimus (*Amphidromus*) *beccarii* T. C., Annali Mus. Civ. Stor. Nat. di Genova, xx, 1884, p. 170, pl. 1, f. 10, 11.—*A. beccarii* Fulton, t. c., p. 74.

A peculiar species, resembling the *A. winteri* group of Java in its plicate surface, but distinguished by the narrow, elongate mouth, oblique sutures and slender contour. Possibly belongs to the second division of the genus, which includes thin, exclusively sinistral species.

4. *Group of A. perversus.*

Considerations of utility no less than probable phylogenetic relationship induce me to segregate the species of the Philippines, Borneo, Celebes and Java from those living north of Sunda Strait, though the latter are not separated from these by any characters of more than specific weight. The senior species of the group, *A. perversus*, has been understood to cover many and diverse species or varieties by Pfeiffer and others, and not without reason; but it is now restricted to a solid, yellow or black-varixed form of southern Celebes and Java, around which a number of closely related forms group themselves. There seem to exist more or less complete transitions between *perversus*, *interruptus*, *sultanus*, etc.; and even the more northern forms, *melanomma*, *atricallosus*, *leucoxanthus*, which I group separately, are united to *perversus* by various authors, as Mr. E. A. Smith and Mr. H. Fulton. Others, as Prof. E. von Martens and Dr. O. von Möllendorff, take a more analytical view. The fact seems to be that while most specimens are readily assignable to one or other of these names, there exist transitions between *perversus* and the *interruptus* group inhabiting the same area; and there may be transitions where the ranges of the several closely allied forms meet or overlap. In general, I consider it best in a genus like this, where specific values are notoriously discounted, to recognize as species those forms which have a consistent or harmonic distribution, and readily recognizable characters in the vast majority of specimens. Exactly similar cases are encountered in the American genera *Oxystyla* and *Cerion*.

The distribution and chief or typical characters of the members of the *perversus* group are as follows:

a. Peristome reflexed, more or less adnate, thick, and usually dark-edged behind in adults; dark varices usually present; imperforate or nearly so.

b. Yellow, with or without dark varices, but not flammulate; rarely white. *perversus*, p. 147.

b^1. Yellow, often greenish below, with or without brown streaks interrupted by a median light girdle · solid, rather straightly conic. Celebes, Borneo, Java. *interruptus*, p. 150.

b^2. Yellow, with broad zigzag or straight stripes and a median golden girdle; ventricose and thin. S. Celebes. *sultanus*, p. 154.

b^3. Pallid, copiously streaked and with black varices the streaks not interrupted; outer lip narrow, mostly adnate; form narrow and high; often perforate. *emaciatus*, p. 153.

a^1. Peristome not adnate behind, not dark-edged; no dark varices; shell not distinctly streaked or banded.

b. Imperforate, yellow or white, sinistral, solid; yellow inside except in white shells. Palawan, etc. *entobaptus*, p. 145.

b^1. Imperforate or nearly so, rather thin, glossy, yellow, the peristome narrow, white. Java. *alticola*, p. 147.

b^2. Perforate or umbilicate, more or less distinctly decussate, uniform or somewhat streaked. Mindanao, Sulu Is. *chloris*, p. 142; *roeseleri*, p. 142.

A. CHLORIS (Reeve). Pl. 50, figs. 28–38.

Shell usually sinistral, *umbilicate or rimate*, oblong-ovate, variable in color, but typically clear bright yellow, with a narrow pale or white band below the suture; *no dark varices;* solid, smoothish, being weakly striatulate and faintly striate spirally. Spire long, a little convexly conic, the apex obtuse, whitish. Whorls $6\frac{1}{2}$, but slightly convex, hardly compressed below the sutures. Aperture small, ovate, white or slightly rufous yellowish tinted within; peristome white throughout, the outer lip thickened, reflexed and recurved but *not adnate behind*, the edge white; columellar margin dilated above, with a thickened white edge passing up the parietal margin some distance; the *parietal callus elsewhere translucent* and showing the underlying color, rarely thicker and whitish.

Alt. 43, diam. 21, longest axis of aperture 21 mill.

Philippines: *Samboanga, S.-W. Mindanao; also Basilan.*

Bulimus chloris Reeve, Conch. Icon. pl. 37, f. 223 (Sept. 1848). —Mousson, Moll. Java, p. 108.—Pfr., Zeitsch. f. Malak. 1849, p. 137; Monogr. Hel. Viv. iii, 320; iv, 382; vi, 26; viii, 42; Conchyl Cab. p. 183, pl. 49, f. 7, 8.—Adams & Reeve, Zool. Samarang, Moll., p. 58, pl. 14, f. 10 (living animal, Mindanao).—*Amphidromus chloris* Rve., Semper, Reisen im Archip. Phil., iii, Landmoll., p. 148.—Hidalgo, Journal de Conchyl., 1888, p. 32; Obras Malacologicas, Mem. Real Acad. Ciencias de Madrid, xiv, pl. 99, f. 3, 4. —Moellendorff, Verzeichniss der auf den Philippinen lebenden Land-mollusken, in Abhandl. Naturforsch. Gesellsch. zu Görlitz, xxii, 1898, p. 149.—*Bulimus sulphuratus* Hombron & Jacquinot, Voy. au Pol Sud, pl. 8, f. 10–12 (? 1848–1853); and text by Rousseau, p. 29 (1854).—*Bulimus* (*perversus var.*) *sulfuratus* Martens, Ostas. Zool. p. 351.

Not *A. chloris* Jacobi, see *A. melanomma natunensis.*

Well distinguished from *A. perversus* by the more or less open umbilicus, non-adnate lip, want of dark varices, elongate form and smaller aperture; and different in its cycle of variations, as well as geographically segregated. The specific rank of *A. chloris* rests upon a basis wholly different from *interruptus*, and far less questionable.

Pfeiffer, Semper and Hidalgo have affirmed the identity of *B. sulphuratus* with *chloris*. The type locality of the former is Samboanga, in southwestern Mindanao, while *chloris* was from "Eastern Islands." Fulton and some others have reported *chloris* from the Malay Peninsula; but I am disposed to consider this locality a mistake, or based on a similar but distinct form. If it should be correct, then the species described above will take the name *sulphuratus.*

Semper found it rather common in marsh and mountain region about Samboanga, but not on the adjacent island of Basilan. All were sinistral, some being yellowish-white, others the typical straw color. Arthur Adams collected "a bushel" of them on the mountains of Mindanao, all "of the same elongated form and deep yellow color throughout, with no indication of bands or marking." The animal is of a pale brown color.

The J. B. Steere expedition to the Philippines collected specimens at Samboanga typical in form and coloring (pl. 50, figs. 29, 30), and

others of stouter contour, of a very pale buff tint, almost white (pl. 50, figs. 31, 33, 34). This may be called color var. *pallidulus*. Two specimens measure: the stoutest, alt. 44, diam. 26½, longest axis of aperture 24½ mill.; and the most slender, alt. 46, diam. 25, longest axis of aperture 23½ mill. A dextral specimen of this color-form (fig. 31) is more slender, alt. 40, diam. 20, aperture 20 mill. This is the only dextral *chloris* I have seen or heard of, and may perhaps be regarded as an atavistic individual. Another shell (fig. 30) is quite small, and pale lemon-yellow.

Basilan. The Steere Expedition also collected examples of *chloris* on Basilian island (figs. 32, 35, 36–38), where Semper did not find it. They are identical in form with Samboanga shells, but vary in color as follows: (*a*) Color of the typical yellow tint, but rapidly fading to white on the spire, pl. 50, fig. 35. (*b*) Pale citron or greenish-yellow, the spire white, fig. 37. (*c*) Similar to color-var. *pallidulus*, but with a slightly darker sutural border and no white band. (*d*) Pure white throughout, color-var. *purissimus*, fig. 32. (*e*) Pale yellow or rufous, with oblique reddish-brown streaks on the spire or throughout, the suture narrowly marked with the same, color-var. *calista*, fig. 36. (*f*) Brilliant rose-pink, with white subsutural band and darker sutural line to the apex, color-var. *rosa*, fig. 38.

Figure 28 is a copy of Reeve's type figure. Figs. 29–31, 33, 34 are from Samboanga, 32, 35, 36–38 from Basilan specimens.

A. roeseleri Moellendorff.

Shell sinistral, half-covered perforate, ovate-conic, solid, transversely lightly striatulate, *decussated by delicate and close but very distinct spiral lines;* satin-like, white. Spire moderately long, with slightly convex sides and obtuse apex. Whorls 6, moderately convex. Aperture moderately oblique, subauriform; peristome rather widely expanded, white-lipped, a little reflexed, columella straight, forming a rather distinct angle with the basal margin, heavily calloused, dilated above, revolute, nearly covering the perforation. Alt. 47, diam. 27, aperture 24.5 mill. long, 18 wide (*Mlldff.*).

Sulu Island (I. Roeseler).

A. roeseleri Moellendorff, Nachrbl. d. D. Malak. Ges. xxvi, p. 210 (Dec. 1894), Fulton, Ann. Mag. N. H. (6), xvii, p. 75.—*A. maculiferus* var., Smith, Ann. Mag. N. H. (6), xiii, p. 55, pl. 4, f. 9, 9*a* (Jan., 1894).

Remarkable by its pure white color, very distinct spiral striation and satin luster. Differs from *A. maculiferus* also by the shorter, more obese contour, somewhat more convex whorls and comparatively wider aperture.

Fulton refers *A. maculiferus var.* of Smith (pl. 49, figs. 23, 24), from Bilatan I. (one of the southwestern or Tawitawi group of the Sulus), to *roeseleri*. They are "either pale lemon-yellow or pinkish-white," from about 50 to 55 mill. long and all sinistral, according to Smith. Fulton remarks "smaller than *maculiferus*, of uniform cream-color, with a very narrow golden band at suture of lower whorls, very closely and (under the lens) distinctly spirally striated."

Although *A. roeseleri* has been grouped with *maculiferus* by authors, it may prove more closely allied to *A. chloris* of southwestern Mindanao and Basilan, which is also umbilicated and, especially on Basilan, densely though shallowly striated spirally. It is named for a well-known collector of orchids in the East Indies.

A. ENTOBAPTUS Dohrn. Pl. 51, figs. 42–46.

Shell sinistral, *imperforate*, conic-ovate, rather solid, striatulate, a little shining; [deep yellow], pale citron or whitish, the apex and sometimes a narrow sutural band white [or the whole shell white]. Whorls $5\frac{1}{2}$ to 6, a little convex. Aperture acuminate-oblong, *deep yellow within* [or white in white specimens]; peristome thickened, narrowly reflexed, white; columella vertical, straight. (*Dohrn.*)

Length 46, diam. 27, aperture 24 mill.

Length 44, diam. 29, aperture 26 mill.

Length 47, diam. 27, aperture 26 mill.

Length 43, diam. 24, aperture 25 mill.

Paragua (Palawan): *Puerto Princesa* (Dr. Platen); *Forest of Canigoran, near Puerto Princesa*, white specimens from the same place; and the forest of *Destacamento de Bahile* (Quadras). *Linaeakan*, *Busuanga* (var. *gracilis*) and *Koran*, *Calamianes* (var. *contracta*). *Balabac Id.* (Everett).

Amphidromus perversus L., HIDALGO, Journ. de Conchyl. 1888, p. 32.—*A. entobaptus* DOHRN, Nachrbl. d. Malak. Ges. 1889, p. 62. —MOELLENDORFF, Verzeich. Phil. Land-moll., p. 148, with var. *gracilis* and *contracta* (undescribed), 1898.—SMITH, P. Z. S. 1895, p. 99.—HIDALGO, Obras Malacológicas, in Mem. Real. Acad Ciencias de Madrid, xiv, pl. 99, f. 5–8 (1900).—*A. perversus* var. *entobapta* FULTON, Ann. Mag. N. H. (6), xvii, p. 67 (1896).

This species differs from *A. perversus* in the larger aperture, which is more oblique and more acuminate above, in the recurved but not smoothly adnate lip, and in the deep color of the inner layer of the shell (whence the name *entobaptus*, dyed within), which however does not hold in white examples. *Dark varices are never developed.* Dohrn writes as follows: "In this species the yellow layer of the shell is on the inside, but in *A. perversus* it is external; and therefore the inside of the aperture in *A. entobaptus* is much more deeply colored than the outside, which is covered by an uncolored layer, while in *A. perversus* the inside is always pure white. The peristome of *entobaptus* is white, the intensely citron-yellow or egg-yellow being suddenly cut off. A section of the shell shows that the colored layer is not quite so thick as the overlying white layer, and becomes thinner near the aperture, and in the formation of the lip it gives place to the outer layer. In *A. perversus* the outer, colored layer is thinner than the underlying alabaster-white layer."

The coloration varies more than Dohrn was aware of, the chief forms before me being as follows:

(1) Shell stout, decidedly conic, alt. 42½, diam. 25, aperture 24 mill. (*a*) Colored as in (*d*), but with a narrow white subsutural band, or flesh-tinted, yellow inside (fig. 44). (*b*) Pale lemon or greenish-yellow, or fleshy-yellow, as though overlaid with a thin white layer, or almost white, the interior deep yellow, fig. 43. (*c*) Pure white throughout, fig. 42.

(2) Shell slender, alt. 47, diam. 24, aperture 24½ mill. (*d*) Bright straw-yellow outside and within, the white sutural line scarcely noticeable, fig. 46. (*e*) Very pale citron, somewhat deeper inside, fig. 45. Paragua.

The varieties grouped above under (1) seem to be typical *entobaptus*, although the specimens figured and others before me are from Busuanga. Those grouped under (2) may be von Moellendorff's *gracilis*, but the specimens figured were received from him some years ago as from Paragua. I know nothing of the undescribed variety *contracta* Mlldff. Hidalgo, in his magnificent iconography of the Philippine fauna, has figured yellow, reddish, violaceous and green color-forms.

As Puerto Princesa is near the southwestern end of Palawan, the species probably occurs throughout the length of that island, and through the Calamianes to Busuanga. In the other direction it

reaches to Balabac Strait, being enumerated by Mr. Smith among Everett's Balabac shells.

A. ALTICOLA 'Boettger' Fulton. Pl. 53, figs. 75, 76.

Shell imperforate or nearly so, oblong-ovate, either dextral or sinistral, *rather thin, glossy*, striatulate, and having extremely fine spirals; *yellow*, with a narrow whitish subsutural band. Spire straightly conic, the apex whitish, obtuse; whorls $5\frac{3}{4}$, the earlier white with a gray band below. Aperture oblique, pale yellowish within, the *peristome narrow*, white, subreflexed; columella straight, rather thin; a translucent film across the parietal wall.

Alt. 37, diam. 20 mill. (type).

Alt. 34, diam. 18, longest axis of aperture 18 mill. *Java.*

A. alticola (Boettger MSS.) FULTON, Ann. Mag. N. H. (6), xvii, p. 70, pl. 6, f. 5, 5*a* (January, 1896).

"Easily separated from all other known species of this group by its small size, narrow form and thin substance." The lip is quite narrow, and expanded rather than reflexed.

A. PERVERSUS (Linné). Pl. 51, figs. 47–52.

Shell rather solid, imperforate or nearly so, smoothish, striatulate, *clear yellow, uniform, or with one* (more rarely several) *blackish variceal stripes;* no pale border below the suture. Whorls $6–6\frac{1}{2}$, slightly convex, the last rather inflated. Aperture white throughout, the lip thick, white, *revolute, and adnate behind*, where it is edged with black-brown, in adult specimens.

Alt. 46, diam. 26, longest axis of aperture 25 mill.

Southern peninsula of Celebes; Java; a variety in Borneo.

Helix perversa L., Syst. Nat. x, p. 772, exclusive of all references except those to Gualtieri and Argenville (1758).—*Helix sinistra*, var. *a* and *b*, MÜLL., t. c., p. 90.—*Helix dextra*, var. *a* and *b*, MÜLLER, Verm. Terrestr. et Fluv., ii, p. 89 (1774).—MAWE, The Linn. Syst. of Conch., p. 161, pl. 29, f. 1 (1823).—*Bulimus dexter* Müll. (in part), DESH. in Fér., Hist., p. 22, pl. 148, f. 3 (??).—*Bulimus citrinus* BRUGUIERE, Encycl. Méth., p. 313, exclusive of var. *C* and *D* (1792).—CROUCH, Illustr. Intro. to Lam. Conch., p. 28, pl. 15, f. 4 (1827).—KÜSTER, Conchyl. Cab., p. 13, pl. 6, f. 4–7; pl. 9, f. 1, 2; pl. 10, f. 1–3.

Bulimus perversus L., MOUSSON, Land- und Süsswasser-Mollusken

von Java, p. 28, 108, pl. 20, f. 5 (1849).—Pfr., Zeitschr. f. Malak. 1849, p. 129.—Hombron & Jacquinot, Voy. Pol Sud, pl. 8, f. 9 (Borneo).—Desh. in Fér., Hist., ii, pt. 2, p. 20, pl. 148, f. 1–8.—Martens, Ostas. Landschn., p. 349, with var. *obesus* and *tener*, p. 350; Malak. Bl., xx, 1872–3, p. 173 (Celebes); Novit. Conch., p. 127, pl. 128, f. 11, 12 (young shell, from Maros, S. Celebes).—*Amphidromus perversus* (L.) Martens, Zool. Ergebnisse einer Reise in Niederlandisch Ostindien, ii, p. 239 (Celebes); 1891.—E. A. Smith, Proc. Malac. Soc. Lond., ii, p. 98 (Celebes).—Mlldff, Nachbl. d. D. Malak. Ges., 1896, p. 145 (Celebes).—P. and F. Sarasin, Die Land-mollusken von Celebes, p. 209 (1899).—*A. perversus niveus* P. & F. Sarasin, t. c., p. 209, pl. 26, f. 262.—*Amphidromus perversus* var. (*atricallosus*) Smith, P. Z. S., 1895, p. 115, pl. 3, f. 19 (Borneo).—*A. perversus var. atricallosus* Gld., Schepman, Moll. Dutch Borneo Exped., in Notes from the Leyden Museum, xvii, p. 156, June 9, 1896 (Borneo).

Helix aurea Dillwyn, Descript. Catal. ii, p. 936 (1817).—Fer., Prodr., p. 55.—(?) *Bulimus aureus* Swainson (*de novo*), Zool. Illustr. i, pl. 47, upper and lower figures (1820–21).—*Orthostylus aureus* Beck, Index Moll., p. 50.—*Bulimus perversus aurea* Martens, Ostas. Zool., Landschn., p. 349, pl. 20, f. 13.—*Amphidromus perversus* (L.) var. *aurea* v. Mts., Boettger, Bericht Senckenb. naturforsch. Gesellsch. in Frankfurt a. M., 1890, p. 146; 1891, p. 244 (Java).

Distinguished from *A. interruptus* chiefly by its fuller, more ovate contour, although it is less obese than most *sultanus*. The south Celebes and Javan form may be considered typical (pl. 51, figs. 48, 49, 50) Bornean examples diverging somewhat.

The var. *obesus* of von Martens is referable to typical *perversus*. Var. *aurea* von Martens, which he identifies with *aurea* of Ferussac and Swainson, is not the earlier *aurea* of Martyn, and the name will have to be dropped. It pertains to orange-colored specimens which have occurred in Celebes at Tempe, and in Java at Gunung Gedeh. It seems to be an ill-defined form, probably not requiring a special name, as Boettger found it running into yellowish-white at Gunung Gedeh.

Celebes. The first reliable report of *perversus* from southern Celebes was by Prof. von Martens in 1873. Dr. A. B. Meyer collected 25 specimens near Batu-besi cave, near Maros, which are de-

scribed as smooth, of a beautiful citron-yellow, sometimes verging toward reddish, without flammules, but almost always with one, rarely two, black-brown varices, usually on the penult. whorl, but varying in position; when dark varices were wanting, a white stripe replaced them, but only on two shells. The contour varied, alt. 49, diam. 24, and alt. 46, diam. 27, being the extremes. Sinistral and dextral shells were in about equal numbers. Young shells show a narrow, dark brown spiral band somewhat below the periphery.

Dr. Max Weber collected similar shells at Bulu Sipong, near Maros, and at Loka, near Bonthain; reported on by von Martens. The contour varying considerably, the smallest, alt. 37, diam. 22 mill., and the more obese examples 37–38 long, 26 wide. The var. "*aureus*" Mart. was taken at Tempe (Wadjo), this being the first definite locality for the orange-yellow form.

Mr. A. Everett also took specimens in the region of Mt. Bonthain, similar in characters to the above typical form. They occurred with *interruptus*, at a height of 2000 ft. (Smith, 1896.)

Von Möllendorff reports specimens collected by Fruhstorfer at Bua Kraenz occurring with *interruptus*.

P. & F. Sarasin found the typical *perversus* at Makassar, 25 dextral and 7 sinistral shells, and on the Lura lake, a large, very narrow form which is rare at Makassar, and has generally a brown-violet tinted peristome, 15 sinistral shells.

Var. *niveus* P. & F. Sarasin. Pl. 51, fig. 47.

Snow white with black varices and often a dark stripe behind the peristome. Variable in proportions as well as absolute size, alt. 42 to 53 mill. Seven specimens show a narrow brown spiral line close to the suture, on the upper whorls, and in four there is the rudiment of a dark band at the periphery of the last whorl near the mouth.

Celebes: *Pare-Pare*, on dry andesite hills, 34 specimens; *Eurekang* 1 specimen; all sinistral (Sarasin).

Two typical, yellow, sinistral *perversus* occurred with the *niveus*, Sarasins regarding them as atavistic individuals.

Java. On the outliers of Gunung Gedah, Dr. Adolf Strubell found both dextral and sinistral specimens, which Boettger describes as perforate, rather glossy, obesely fusiform-ovate, of a beautiful uniform citron-yellow with white, appressed suture, which is distinctly crenulated by growth-striæ, and without dark varices. Alt. 48–49, diam. $27\frac{1}{2}$–28, alt. aperture 25 mill. (dextral); alt. 51, diam.

28, aperture 25¼ mill. (sinistral). Other specimens are duller yellow, partly even yellowish-white, although collected alive.

Still other Javan specimens agree with the typical form from S. Celebes in the yellow color, blackish varices and lip-edge; while still others (pl. 51, fig. 51) are white, with several blackish varices, and black-brown lip-edge, thus agreeing with the Celebes form *niveus*. The specimen figured is from coll. G. H. Clapp.

Borneo. Mr. A. Everett collected two dextral specimens (pl. 51, fig. 52) at Sadong, West Sarawak, one of which Mr. E. A. Smith has figured; neither of them have black varices, and the parietal wall is dark, as in *atricallosus*. Schepman reports similar specimens from Mt. Sekedau and Mt. Dadap, coll. by Moret, but he mentions that they have brown spots on the white zone near the suture. This form is probably a modification parallel to, rather than genetically connected with *A. atricallosus* of the mainland, and may be called form *similis*.

Swainson has figured shells with the adnate lip, black bordered on the reverse, of *A. perversus*, but of rather more elongate form, and having a white zone below the suture. The locality is unknown, and I do not know whether to think it a form of *A. perversus* or of *A. leucoxanthus*. The white parietal callus and different lip would seem to remove it from *A. atricallosus*, though that species sometimes buries the dark parietal color under a copious white layer. See Bligh Catalogue, upper figure of first plate, and Zoological Illustrations vol. i, pl. 46, under the name *Bulimus citrinus*.

A. interruptus (Müller). Pl. 52, figs. 53, 54, 55, 56.

Dextral or sinistral, imperforate, rather narrow, with high spire and white apex; whorls 6½; ground-color yellow, either sulphur, maize or paler tint, with a broad *purplish zone on the base;* marked with numerous reddish-chestnut streaks, which are interrupted at the periphery, *and fall far short of the suture above, and on the base become purplish-brown; a white or yellow patch around the columella;* these markings obsolete on the spire or appearing as short streaks above the suture on the next to the last whorl. There is a dark varix on the penultimate and sometimes another on the last whorl. Aperture rather small; lip white, reflexed and *adnate*, the edge of the reflection generally brown.

Alt. 47, diam. 25, aperture 23 mill.

Alt. 41, diam. 21, aperture 19½ mill.

Color-form *infraviridis* Martens (pl. 52, figs. 59–65). Greenish-yellow or citron colored, the base pale green; or with the base also greenish-yellow (pl. 50, fig. 41, 42).

Color-form *strigosus* Martens (pl. 52, figs. 57, 58). Streaked from suture to base with continuous, rather narrow brown streaks.

Java: *Pardana* in the Bantam residency, *Rogodjampi*, Banjumas res., and the island *Nusa-Baron* (Zollinger); *Surabaya* (Martens) forms infrapictus and strigosus.

Bali: *Djembrana* and *Buleling* (Zollinger), short and conic, the markings between infrapictus and strigosus.

Borneo (Schwaner), rather long *strigosus*, many with reddish apex, the aperture comparatively large, peristome thin; *Bandjermasin* (Bock).

Celebes: *the southern peninsula*, plentiful (see below).

Helix interrupta Müller, Verm. Terrestr. et Fluv. ii, p. 94 (1774).—Chemnitz, Syst. Conchyl. Cab. ix, p. 154, pl. 134, f. 1213, 1214 (1786); edit. nov. pl. 10, f. 4, 5.—Dillwyn, Descript. Catal., ii, 937.—*Bulimus interruptus* Müll., Pfr., Zeitschr. f. Malak. 1849, p. 131; Conchyl. Cab. pl. 22, f. 4; pl. 41, f. 9, 10?—Bock, P. Z. S., 1881, p. 633.—*Bulimus interruptus* var. *sultanus* Mouss., Moll. Java, p. 30, 31, 109, pl. 4, f. 1, 2 (Puger, on the islet Nusa-Baron); Zeitschr. f. Malak., 1849, p. 179.—*Bulimus interruptus* var. *infrapictus* Martens, Ostas. Landsch. p. 344, pl. 20, f. 1, 9 (= typical *interruptus*); var. *strigosus*, pl. 20, f. 3, 6; var. *infraviridis*, pl. 20, f. 2, 5, 8 (1867).—*Amphidromus interruptus* Müll., Semper, Reisen, p. 147 (anatomy; locality of specimens not stated).—Moellendorff, Nachrbl. d. D. Malak. Ges., 1896, p. 145, and var. *contracta*, p. 146.—*Bulimus sultanus* var. *b*, Lam., An. s. Vert. VI, pt. 2, p. 119; Delessert, Recueil de Coq., pl. 27, f. 6 (the *strigosus* form).—*Bulimus citrinus* Brug., Swainson, A Catal. of the rare and valuable Shells which formed the celebrated collection of the late Mrs. Bligh, appendix p. 13, lower fig. of first plate (the *strigosus* form).—*Bulimus dexter* Müll., Desh in Fér., Hist., ii, pt. 2, p. 22, pl. 161, f. 7, 8 ("infrapictus").—*Bulimus perversus* L., in part, Desh. in Fér., Hist., ii, pt. 2, p. 20, pl. 161, f. 5, 6 (the "infrapictus" form.—*B. perversus* var., Pfr., Monogr. ii, p. 39.—*A. perversus interruptus* Sarasin, Die Land-Mollusken von Celebes, p. 209 (1899).

The outline of this species is rather straightly conical, and the form less obese than in typical *A. perversus*, the aperture being smaller. The color-patterns differ from those of *perversus*.

Celebes.—Near Maros, in southern Celebes, Dr. von Martens collected three color-forms of *interruptus:* the typical, figs. 55, 56 (also called *infrapictus*); var. *strigosus*, figs. 57, 58; and var. *infraviridis*, figs. 59–65. The species occurs in manifold contour and color-varieties, if not all combinations of both. Among the Maros examples there are two numerically prevalent forms: moderately large *infraviridis* of conic-ovate shape and rather thick lip, fig. 65, and small "*infrapictus*" of rather elongate shape with strongly thickened lip, fig. 55. The intermediate forms, as well as the quite slender and the entirely streaked, occur only in occasional individuals, though sufficient to prove the connection of the series. This is also demonstrated by comparison of the Javan examples, of which there were many connecting the varieties, and showing that a division is no more to be based upon locality than upon color and contour (Ostas. Zool. Landschn., p. 345).

The above data prove that the color-forms represented on pl. 52 have no truly varietal status, but are simply individual variations comparable to the well known band variations of *Helix nemoralis*. Müller's type was an individual of what Prof. von Martens has called var. *infrapictus*. About three-fourths of the specimens examined by von Martens are dextral.

Of 10 greenish-yellow specimens before me, half are dextral. Most of them have a white or bluish varix, and some a white basal patch. The lip is white throughout. None of them are perceptibly greener below than above, but otherwise they agree with Prof. v. Martens' color-var. *infraviridis*.

Figs. 41, 42 of pl. 50 represent a peculiar form from coll. John Ford, locality unknown, remarkable for its very elongate shape. There are 7 whorls, the last with a gray-white or greenish varix. The lip is recurved, enveloping and adnate, white throughout. Color sulphur-yellow, paler above. Length 50, diam. 21, aperture 23 mill.

P. and F. Sarasin found *interruptus* very variable in form at Makassar, 17 dextral, 10 sinistral specimens. The ground color is sometimes very light, sometimes dark yellow, and rarely almost white. Markings typical ("*infrapictus*") or of the *sultanus* pattern,

or the *strigosus* pattern; all these intergrading completely. At Allu, on the southern coast, 2 sinistral and 1 dextral shell, with brown streaks on the base, the rest of the shell uniform light yellow. At Bungi, on the Gulf of Mandar, 19 sinistral specimens with light yellow or nearly white ground-color, and typical "*infrapictus*" markings.

Dr. von Moellendorff reports the species from Tempe (Weber) and from Bua Kraeng (Fruhstorfer), at 5000 ft. alt. Those from the latter locality he describes as var. *contracta* v. Mlldff., differing in the shorter, more ventricose shell, alt. 41, diam. 26 mill., a dextral specimen, and alt. 40, diam. 27 mill., sinistral.

Java.—Besides the localities given above, Herr Gust. Schneider collected the form *infrapictus* at the islands Bali and Bawean (the latter N. E. of Java). (Martens, Nachrbl. 1900, p. 17).

Borneo.—Bock notes that *interruptus* is very abundant in the Banjermassin district of southern Borneo, both dextral and sinistral, and variously colored; after rains the trees were quite spotted with them. "Of the rare pure white variety only one specimen was obtained." Specimens before me from Southeastern Borneo (pl. 50, figs. 39, 40), collected by Doherty, agree with Hombron & Jacquinot's figures (Voy. au Pol Sud, pl. 8, f. 7, 8, as "*B. inversus*") of a Bornean specimen. The shell is cream-white (yellow in their figures) with much the pattern of var. *emaciatus*, chestnut stripes which are weak above the periphery, stronger, wider and more numerous below, breaking off abruptly at the small white umbilical patch; apex light; lip recurved, adnate and black-edged behind; perforate or closed; a black varix on the penult. whorl or none. It differs from var. *emaciatus* chiefly in the shorter, more ventricose form and consequently wider aperture. Occurs both dextral and sinistral. This may be called var. *borneensis*.

Subsp. emaciatus (Martens). Pl. 53, figs. 77, 78.

Shell dextral or sinistral, perforate or closed, conic, *oblong*, striatulate, but little shining, pale sulphur colored (or white), having longitudinal brown streaks which are more sparse and paler above, but closer and darker on the base, and are not interrupted by a peripheral light girdle; and one or two black varices. Whorls $6\frac{1}{2}$, but little convex. Aperture less than half the shell's length, whitish within; peristome white, reflexed, recurved, and generally with a

dark brown edge, which is usually in large part adnate; columella vertical, straight; parietal callus white or showing the stripes through.

Length 48, diam. 25 mill.

Length 50, diam. 24 mill.

Length 44, diam. 24 mill.

Length 52, diam. 25, length of aperture 26 mill.

Java: *Grissé, near Surabaya*, dextral (Martens). Bali: *near Buleling*, sinistral and dextral (Zollinger). *Oonerang* (coll. A. N. S., fig. 78).

Bulimus emaciatus MARTENS, Ostas. Landschn., p. 347, pl. 20, f. 7 (1868).—PFR., Monogr., vi, p. 25.

The streaks generally extend to the suture above, though becoming narrower or diluted, and may either continue to the base or give way to a white patch around the columella. They are often more or less zigzag, and on the base tend to become darker and confluent. They are *not interrupted by a light peripheral girdle*. In one of the specimens before me the upper whorls are banded as in young *A. sultanus*, and the apex is purple. In the others it is white. One of seven specimens before me is sinistral.

Subsp. SULTANUS (Lamarck). Pl. 53, figs. 66–74.

Shell imperforate, ovate, rather thin, finely striatulate and densely striate spirally, these striæ sometimes obsolete; glossy; yellow, buff or pinkish-buff, the last whorl or two with *numerous rich chestnut stripes*, which are more or less zigzag, and *diluted by an interrupted yellow peripheral zone*, or in some shells the stripes are much reduced; varices one or none. Whorls $6\frac{1}{2}$, the earlier ones yellow, then banded at the sutures above or below, or plain. *Last whorl capacious*, inflated, compressed below the suture or not perceptibly so.

Aperture whitish within; peristome white, narrowly reflexed and slightly recurved at the edge, not much thickened; parietal callus white.

Alt. 50, diam. 28, aperture 28 mill.

Alt. 41, diam. 25, aperture $23\frac{1}{2}$ mill.

Celebes: *Makassar* (Hombron and Jacquinot, Zollinger, Wallace, v. Martens), on the foliage of high trees; *Tempe* (Weber). *Saleyer I.* (Weber). Java: *near Rogodjampi, in Banjumas, and Banju-*

wangi (Zollinger). Bali: *Djembrana* (Zollinger). Java (M. Leschenault; type locality).

Helix flammea sinistrorsa CHEMNITZ, Conchyl. Cab., ix, pt. 1, fig. 927; copied in edit. Küster, *Bul.*, pl. 6, f. 3 (bad).—*Helix inversa* var. *a* FÉR., Prodr., no. 414.—*Bulimus sultanus* LAM., An. s. Vert., vi, pt. 2, p. 119, exclusive of var. *b* (1819); and in edit. Deshayes, viii, p. 225.—DELESSERT, Rec. de Coq., pl. 27, f. 7.—CHENU, Illustr. Conch., pl. 8, f. 10.—MARTENS, Ostas. Conch., p. 342, pl. 22, f. 1, 3, 4.—*Amphidromus sultanus* v. MARTENS, Zool. Ergebnisse einer Reise in Niederländisch Ost-Indien, ii, p. 240 (1891).—*Bulimus perversus* var. ζ and η PFR., Monogr., ii, p. 38.—*Bulimus inversus* var. b, *flammeus* MOUSSON, Moll. Java, p. 106.—PFR., Monogr., iii, p. 318.—*Bulimus makassariensis* HOMBRON & JACQUINOT, Voy. au Pol Sud, Moll., pl. 8, f. 5, 6.—*Amphidromus makassariensis* WALLACE, P. Z. S., 1864, p. 412.—*A. perversus var. interrupta* FULTON, Ann. Mag. N. H. (6), xviii, p. 68 (in part).

Very good figures have been given by Hombron and Jacquinot, and by von Martens. It is well distinguished from *interruptus* Müll. by its more ventricose form, larger aperture and thinner substance. The broad, more or less zigzag stripes and interrupted peripheral golden band are also characteristic, though much reduced, or even absent in some specimens. About half of the shells before me are sinistral. The young (fig. 67) are either uniform yellow or have narrow bands at the suture, above and below the periphery, and around the columella. Figures 66–68 reproduce von Martens' illustrations of specimens from Makassar. Figs. 69, 70 are further color-patterns in coll. Acad. Nat. Sci.

A clear yellow form, with no flammules, but with a narrow dark varix on the penultimate whorl, and a dark-edged lip, is also illustrated, pl. 53, figs. 73, 74. This forms a transition to typical *perversus* in color, but has the inflated contour and narrowly recurved lip of *sultanus*, and is connected therewith by specimens with sparse stripes (figs. 71, 72), referable to var. *mitra*.

Var. MITRA (von Martens).

Shell short, of conic figure, beautiful golden yellow with broad reddish chestnut-brown stripes which rarely extend upon the upper portion of the last whorl; there is a more intense golden yellow band, which, however, is not sharply defined at the edges. Length

47, greater diam. 28, lesser 24, aperture $23\frac{1}{2}$ mill. long, $19\frac{1}{2}$ wide. Three sinistral examples, one dextral.

Bali: *Buleling and Djembrana* (Zollinger, in coll. Mousson).

Bulimus mitra Martens, Preussische Exped. nach Ost-Asien. Landschnecken, p. 343 (1867).

According to von Martens, this form may lay claim to uniting *sultanus* and *interruptus*, in which case *emaciatus* must also be added. *B. mitra* has not been figured, nor noticed by other authors hitherto,

5. *Group of A. janus.*

The species grouped here are not closely allied, but all of them have spiral bands, at least in some specimens. *A. janus* has the parietal wall blackish; *A. enganoensis* is distinguished chiefly by its broad columellar margin, and *A. martensi* is a short, obese species, with broad peristome.

A. janus (Pfeiffer). Pl. 58, figs. 14, 15, 16, 17, 18.

Shell perforate or closed, dextral or sinistral, oblong-conic, rather solid, glossy, nearly smooth. *Yellow with a white subsutural band, the spire with two brown or hoary-brown bands, one subsutural, the other submedian;* the last whorl with subsutural and supraperipheral pale green bands; often wanting, and *a green or brown-green base; varices narrow, black brown, broadly yellow-bordered* on both sides, *interrupting the spiral bands and basal patch;* two or three earlier whorls uniform yellow or whitish. Spire rather high-conic; whorls about $6\frac{1}{2}$, convex. Aperture small, slightly oblique, pale-yellow or whitish within, and showing *chestnut bands or basal patch, this color stopping far short of the lip;* peristome white, reflexed and recurved at the edge, thickened; the columellar margin dilated above; *parietal callus blackish chestnut.*

Alt. 47, diam. 24 mill.

Alt. 39, diam. 21, longest axis of aperture 20 mill.

Alt. 42, diam. 21, longest axis of aperture 21 mill.

Burmah (Coll. A. N. S. P.); *Mergui* (Theobald).

Bulimus janus Pfr., P. Z. S. 1852, p. 85; Conchyl. Cab., p. 156, pl. 48, f. 1–4; Monogr. iii, p. 310; iv, 374; vi, 20; viii, 24.—Gassies, Moll. terr. Nouv.-Caledonie, i, p. 49, pl. 5, f. 5.—*Canistrum janus* Feld.—*Cochlostyla janus* Schaufus in Paetel.—*Amphidromus janus* Crosse, J. de Conchyl. 1894, p. 172.—Nevill, Handlist Moll. Ind. Mus., i, p. 126.—*Bulimus atricallosus* Gld.,

HANLEY & THEOBALD, Conchologia Indica, p. x, pl. 19, f. 5 (not of Gould).

Somewhat allied to *A. dohrni*, this species differs by its black-brown parietal callus, more deeply constricting sutures, heavier lip, which is not appressed behind, etc. *A. comes* is much stouter and differently colored. The doubtful *B. virescens* of Swainson had no dark parietal callus. *A. janus* stands quite alone for an *Amphidromus*, having no close companions.

The bands and basal patch are brown, but show green through the citron-colored outer layer of the last whorl; they are often wanting on the upper part of the body-whorl, and are broadly interrupted at the varices and behind the lip.

The species was supposed by Pfeiffer to be from the New Hebrides. Gassies introduced it into his New Caledonian fauna on evidence which proved to be false. Specimens in our collection *sub nom. B. atricallosus* bear the locality "Burmah," which is the more probable as Hanley and Theobald figure *janus* for *atricallosus* in the *Conchologia Indica*, and Nevill records specimens from Mergui in the Indian Museum, ex coll. Theobald. Pfeiffer's name *Janus* refers to the aperture looking in opposite directions in different specimens.

A. ENGANOENSIS Fulton. Pl. 61, figs. 53, 54, 55, 56.

Shell *openly perforate*, sinistral, oblong-ovate, solid, glossy, striatulate, *ground-color olivaceous yellow* (or rich brown), *fading to pale buff toward the suture* and on the spire, with some irregular olive streaks, and sometimes four reddish-brown bands—subsutural, circum-umbilical, and two between, the upper two ascending the spire; early whorls uniform white, yellowish, or with a dark band above the suture. Varices narrow and brown, followed by a whitish streak, or wanting. Whorls $6\frac{1}{2}$–7, *convex*, separated by a white-edged impressed suture, the last whorl inflated. Aperture oblique, white or lilac-tinted within, and showing the bands when present; *peristome white, broadly reflexed*, recurved at the edge, the *columella convexly folded, the reflexed margin broadly dilated, and somewhat lobed* over the umbilicus, *impressed near its insertion. Parietal callus translucent*, the color of the cuticle showing through it.

Alt. 49, diam. 27 mill. (type).

Alt. 50–51, diam. 27, longest axis of aperture, 27 mill.

Alt. 54, diam. 26, longest axis of aperture, 26 mill.

Alt. 38, diam. 21½, longest axis of aperture, 19 mill.

Engano Island, west from the south end of Sumatra (Dr. G. Modigliani, Mr. Wm. Doherty).

A. enganoensis Fulton, Ann. Mag. N. H. (6), xvii, p. 71, pl. 6, f. 11 (Jan., 1896).—Henderson, Nautilus xii, p. 15 (June, 1898).

A very distinct species, varying notably both in coloration and size. Fulton describes it as with the "ground-color either yellow or rich brown, sometimes in the latter case with two or three darker brown spiral bands;" and he figures a brown specimen (fig. 53). The shells collected by Doherty (figs. 54, 55, from coll. John B. Henderson, Jr.) are olivaceous brown, fading above as in *A. aureus*, though sometimes sulphur-stained on the spire, and either with or without four brown zones. The convex columella, impressed at its root, and with more or less produced or lobed outer edge, is characteristic of all colors and sizes.

The small form (fig. 56) was found by Doherty on Pulo Dua, an islet three miles east of Engano.

A. martensi Boettger. Pl. 61, fig. 52.

Shell large, sinistral [or dextral], very shortly rimate, broadly conic-ovate, very solid; very lightly and densely striate, subopaque, *bright citron-yellow with wide white bands around the suture and rimation* and a single basal band on the penultimate (and next earlier) whorls; *the last whorl with two wide olivaceous-green bands below the periphery*, the lower one double the width of the upper; *no dark varices*. Spire high conic, the right side more convex, apex pale rose-white. Whorls 6, a little convex, separated by distinct, appressed sutures, the last whorl rather ventricose, not descending in front, slightly over half the length of the shell. Aperture ear-shaped, white inside and showing the two dark bands through, eight-fifteenths the shell's length; peristome white, thick, callous, *evenly broadly expanded and reflexed throughout*, the margins joined by a white parietal callus; left margin strongly and evenly curved, columella vertical, callous, slightly twisted (*Bttg.*).

Alt. 49–53, diam. 27–30, aperture 26–28 mill.

Borneo: *Mt. Kina Balu* (O. Staudinger & A. Bang Haas; Everett).

A. martensi Bttg., Nachrbl. d. d. Mal. Ges. 1894, p. 66.—Fulton, Ann. Mag. N. H. (6), xvii, p. 71, pl. 7, f. 10.

In the wide white sutural band it approaches *A. leucoxanthus;* in the short, obese shape, *A. interruptus;* but it is more solid, with more convex whorls, much more widely reflexed peristome and entirely diverse color and pattern. The original specimens were sinistral, but Mr. Everett collected dextral examples also, one of which has been figured by Mr. Fulton. It is named in honor of Prof. E. von Martens.

6. *Group of A. aureus.*

Includes forms allied to *A. perversus*, living on the mainland of southeastern Asia, the Malay Peninsula, and various islands as far south as Sunda Strait. Most of the species are more or less concave below the suture, and in only one (*dohrni*), is the lip completely adnate behind, as in *perversus;* some others having it imperfectly adnate, while in most it is merely reflexed or recurved. The following key is artificial and merely a temporary expedient.

a. Shell with a very oblique, strong, white, raised varix on the back. Annam. *costifer*, p 176.

a[1]. Shell solid, large, alt. 64–70 mm., with three elevated girdles. Annam. *ingens*, p. 175.

a[2]. Without such sculpture.

b. Uniform or nearly uniform yellow, white or greenish; lip not adnate behind.

c. Pale yellow, somewhāt cylindrically elongate, peristome narrowly expanded; alt. 39, diam. 17 mm. *cochinchinensis*, p. 178.

c[1]. White or yellow, more conic, the diam. more than half the alt. Annam. *metabletus*, p. 174.

c[2]. White, obese ovate, imperforate, the lip narrowly reflexed. *mundus*, p. 174.

c[3]. Whitish above, greenish-yellow below, last whorl obtusely angular in front, parietal callus thin; alt. 42, diam. 21 mm. Tonquin. *dautzenbergi*, p. 166.

b[1]. Shell yellow, often with white band below suture, and blackish varices; lip recurved.

c. parietal wall white. *leucoxanthus*, p. 163.

c[1]. parietal wall blackish-brown, a solitary blackish varix. ♂ *tricallosus*, p. 165

b^2. Shell yellow above, green below; spire pyramidal; lip thick, completely adnate and black-bordered behind. *dohrni*, p. 173.

b^3. Shell clouded, streaked or banded with reddish or green on a yellow ground; stoutly ovate. *comes*, p. 170.

b^4. Shell copiously streaked with brown.

c. Base abruptly darker than upper surface. *inversus*, p. 167.

c. Base not abruptly darker, often pale below the sutures.

d. large and solid, clouded, length 64–70 mm. *cambojiensis*, p. 177.

d^1 Length 40–60 mm.; streaked. *aureus*, p. 160.

b^5 Shell with three broad spiral bands. *metabletus*, p. 174.

A. AUREUS (Martyn). Pl. 54, figs. 70, 71, 72.

Shell either sinistral or dextral, long-ovate, solid, smoothish, *yellow, with a broad white zone below the sutures, and typically having numerous narrow, reddish-brown, undulating stripes upon the median and basal parts, but not extending over the white zone;* usually with a single varix upon the penultimate or front of the last whorl; spire whitish, the apex typically white, but black in some varieties. Peristome reflexed and recurved, white, *not brown-edged;* parietal callus white.

Alt. 58–60, diam. 29–31 mill., or somwhat smaller.

Prince Island, in Sunda Strait, off the N.-W. extreme of Java, on the upper branches of high trees (Sir Joseph Banks).

Limax aureus MARTYN, Universal Conchology, iii, pl. 115 (and Chenu's reprint, Bibliothèque Conchyliologique, ii, p. 28, pl. 39, f. 2).—*Chersina fulva* and *C. perversa* (in part), Prince's Island, HUMPHREY, Museum Calonnianum, p. 63, no. 1163, 1164 (1797). —*Helix perversa* DONOVAN, Naturalist's Repository, or Monthly Miscellany of Exotic Nat. Hist., ii, pl. 49, f. * * typical, and f. * color-var. (1824).—Not *Helix*, *Bulimus* or *Amphidromus aureus* of Dillwyn, Ferussac, Swainson *et al.*

This hitherto misunderstood form is one of those brought to Europe by the heroic South Sea explorers of the eighteenth century. It was collected by Sir Joseph Banks, who accompanied Cook on

his first voyage. Landing for water and wood at Prince Island, as they were leaving Sunda Strait, some lofty trees were felled by the sailors, and these shells were found among the foliage. The specimens figured by Martyn and Donovan (and therefore my copies, pl. 54, figs. 70–72) were from this source.

The typical form of *aureus* has close, waved stripes (figs. 70, 71), but a plain form (fig. 72) occurs with it on the trees on Prince Island. This unstriped color-variety is practically identical in characters with *leucoxanthus* Mts.

Dr. von Martens subsequently restricted the name *aureus* to another snail, and referred Martyn's figures to *melanomma*, wrongly identifying the locality with an island in the Straits of Malacca. Afterward, von Martens referred Donovan's figures of some of the Cook's voyage shells to *leucoxanthus* (Nachrbl., 1891, 34), still misidentifying the island where they were collected.

The forms *melanomma*, *natunensis* and *leucoxanthus* are apparently varying geographic races of *aureus*.

Var. MELANOMMA (Pfeiffer). Pl. 55, figs. 80–86.

Shell sinistral or dextral, imperforate, oblong-ovate, *solid and strong;* striatulate. Whitish (rose or cream tinted), with *crowded chestnut streaks*, often irregular or ragged, and typically interrupted by a yellow peripheral girdle, but this is frequently wanting. The streaks may be either continuous from suture to base, or weak below the suture, and leaving a white columellar patch. One or two blackish varices generally present; upper whorls not streaked, white or brown-banded; *apex deep purple*, rarely white. Whorls $6\frac{1}{2}$, the last more or less concave below the suture. Aperture oblique, white within; peristome white, reflexed and recurved, but usually not adnate behind, *the edge white*. Columella vertical, thick, its reflexed edge generally covering the axial chink; *parietal callus strong and white*, deeply entering, often dark within.

Length 46, diam. above aperture 21 mill. (Pfeiffer's type).

Length 41, diam. 24, longest axis of aperture 22 mill.

Length 45, diam. 25, longest axis of aperture 25 mill.

Length 52, diam. 28, longest axis of aperture 27 mill.

Length 40, diam. $24\frac{1}{2}$, longest axis of aperture 22 mill.

Islands near Singapore, esp. Riouw or Rhio; and *Biliton I.*, between Borneo and Banka, on bushes and low trees (A. Adams).

the banded form. *Singapore* (Friedel), with the band obsolete. *Mt. Tchöra and Mt. Tchehel, Perak* (de Morgan).

Bulimus citrinus, in part, Reeve, Conch. Icon. pl. 31, f. 187 a (1848).—Adams & Reeve Zool. Samarang, moll., p. 58, pl. 14, f. 11, living animal (1850).—*Bulimus inversus* var. β and γ Pfr., Zeitschr. f. Mal. 1849, p. 133.—*Bulimus melanomma* Pfr., Zeitschr. f. Mal. 1852, p. 95; Monographia iii, p. 310; iv, 374; vi, 19; viii, 24; Conchyl. Cab. p. 135, pl. 39, f. 28, 29 (type); pl. 41, f. 1, 2, 7, 8.—Martens, Ostas. Landschn. p. 340.—*Amphidromus melanomma* de Morgan, Bull. Soc. Zool. de France pour 1885, p. 387. Mlldff., P. Z. S. 1891, p. 336.—*A. perversus var. melanomma* Fulton, Ann. Mag. N. H. (6), xvii, p. 68 (1896).

From Singapore as a center, this variety has been traced northward to Perak and southward to an islet off the coast of Biliton I., if what A. Adams collected there was really *melanomma*. The habitats "Moluccas," "Celebes" and "Sarawak, Borneo," require confirmation.

The recurved edge of the lip does not completely envelop the back of the reflection as is usual in *interruptus*, and it has no dark line at the extreme edge; the whorls are ordinarily more convex, and the last one is perceptibly concave below the suture. Moreover, the heavily streaked color pattern seems constant in *A. melanomma*, and the ground color is rarely if ever so yellow. *A. interruptus* form *strigosus* Martens resembles some specimens of *melanomma*, but it has the straight-sided spire and adnate outer lip of *interruptus*.

The name *melanomma*, black-eye, refers to the deep purple apical spot, which is rarely replaced by a white apex.

Figures 80, 81 are Pfeiffer's type. Fig. 83 is a very dark specimen from Singapore.

Var. *natunensis* Fulton. Pl. 55, figs. 87, 88, 89, 90.

A large form, depressed below the sutures and with white-edged lip, which is imperfectly or not at all adnate, as in *melanomma;* the apex either purple or white. Color various: (1) "Entirely white, generally with one or more oblique brown stripes or varices. (2) White below the suture in the last two whorls, closely striped beneath with rich brown, often pinkish towards the apex. (3) Yellow but with a broad white zone below the suture, with or without one or two oblique brown varices," or with sparse chestnut streaks.

The darker shells generally without black varices, and having a small white basal patch; all forms occurring either dextral or sinistral.

Length 54, diam. 28, longest axis of aperture 28 mill.

Length 44, diam. 24, longest axis of aperture 24 mill.

Bunguran, Natuna Islands (A. Everett).

Amphidromus perversus Smith, Ann. Mag. N. H. (6), 1894, xiii, p. 457.—*A. perversus var. natunensis* Fulton, Am. Mag. (6), xvii, p. 69 (1896).—(?) *A. interruptus* and *A. chloris* Jacobi, Archiv für Naturgeschichte, lxi, 1895, p. 293, pl. 14 (1896), anatomy.

There is no yellow girdle at the periphery, such as occurs in the typical *melanomma*, though there is often a faint paler line, or a division of the color, as in *A. inversus*. In some specimens, as fig. 88, the white zone below the suture is nearly covered. This variety is remarkably variable in color, size and shape, and varies from 6 to 7 whorls. It seems to me clearly related to *aureus* and *melanomma*, from which some specimens are to be distinguished only by the locality. Many shells are perforate.

The specimens figured are from Bunguran Island, received from Mr. Fulton.

The reference of *A. chloris* and *A. interruptus* of Jacobi to this variety rests upon the locality of his material, as he gives no information on the shells; his *interruptus* being from the Natunas (Bunguran), *chloris* from Djemadja, one of the Anubas (Anamba) group, lying westward from the Natunas proper, and nearer the Malay Peninsula. Jacobi gives full anatomical details, *which show specific differences from A. interruptus.*

Subsp. *leucoxanthus* (Martens). Pl. 54, figs. 73–79.

Shell ovate-elongate, striatulate, glossy; pale greenish yellow *with a wide white sutural band*, with blackish-brown varices, usually several in a group, whorls 7, but little convex; suture deep, appressed. Aperture rounded, two-fifths to one-half the length of the shell; peristome white, moderately thick, narrowly expanded, the parietal callus white; columellar margin nearly perpendicular. Apex white (fig. 74) or black (var. *oculata*, fig. 73). (*Martens.*)

Length 49½, diam. 28½ mill.; length 41, diam. 24 mill.

Length 51, diam. 27 mill.; length 37, diam. 22 mill. (var. *oculata*).

Siam: *between Chantabun and Srakeo* (Pavie).

Bulimus citrinus, in part, Reeve, Conch. Icon. pl. 31, f. 187b.—*Bulimus leucoxanthus* Mart., Monatsberichte der Berliner Akademie, 1864, p. 526; Ostas. Conch. p. 348, pl. 20, f. 11, 12.—Pfr., Monogr. vi, p. 18.—*Amphidromus leucoxanthus* Morlet, Journ. de Conchyl., 1889, p. 127.—*A. perversus var. leucoxantha* Fulton, l. c., p. 60 (1896).—(?)*Bulimus citrinus* Swains., Zool. Illustr., i, pl. 46.—(?) *Bulimus citrinus* (*var. perversa*) Swains., Zool. Illustr., i, pl. 47, right and left figures.—*B. perversus var.*, Pfr., Conchyl. Cab., *Bul.*, p. 379, pl. 39, f. 26, 27.—*Bulimus leucoxarthus* Mart., Pfr.-Clessin, Nomencl. Hel. Viv., p. 212, no. 156.

Variable in form, and with the apex either white or dark; having a broad white band below the suture, the lip white behind, and not adnate. The locality was unknown until Morelet placed specimens collected by Pavie in Siam on record. Figure 74 is von Martens' type.

Specimens from Malacca (Cuming) before me have a strong, convex lobe on the columella, in some not visible from in front but seen in an oblique view. They have the white and yellow coloration which gave the name *leucoxanthus* to the variety, and there is a single black varix on the penultimate whorl. They are either sinistral or dextral, and one is perforate (figs. 76, 77). Some specimens of *A. aureus natunensis* have a similar columellar fold.

Other specimens (pl. 54, fig. 75) bearing the locality Cochin China, are dextral, dwarfed, alt. 36, diam. 22, or a little larger; white and pale yellow, with numerous and wide varices; which, as they indicate growth-arrest, show that the conditions of life were locally not favorable, hence probably the small size.

Still another form (pl. 54, figs. 78, 79) referable to *leucoxanthus* is dextral, brilliant orange, with the usual white zone and a small white basal patch; apex white; varices one or none, but there is a dark line at the periphery of the whorls of the spire, appearing above the sutures or sometimes nearly covered; and there are occasionally some reddish dashes below the suture. The subsutural region is markedly concave, and in one specimen the white band there is but faintly indicated. The shell is very solid and strong, and the lip well developed, the whole aperture faintly pinkish-white.

The following species is closely allied, but has the parietal wall blackish.

A. ATRICALLOSUS (Gould). Pl. 58, figs. 19, 20, 21.

"Shell imperforate, elongated ovate, solid, smooth, and shining, of a sulphur-yellow color; whorls seven, moderately convex, somewhat girt in near the suture; last whorl nearly two-thirds the length of the shell; aperture ovate-lunate, somewhat angular at base, and slightly effuse; lip white, widely revolute, not flattened; columella white, *the callus uniting the extremities of the peristome, and as far within the shell as can be seen, pitchy-black;* from the midst of it, extending across the penult. whorl, is a line of the same color, showing the termination of a former stage of growth. Length $2\frac{1}{3}$ inches; breadth 1 inch" (*Gld.*).

Tavoy, British Burma (Rev. F. Mason); *Mergui and King Is.* (Anderson); *Salanga I.* (Weber); *Penang* (Martens); *probably Siam* (Schomburgk).

Bulimus atricallosus GLD., Proc. Bost. Soc. Nat. Hist. i, p. 141 (1843); Bost. Journ. of Nat. Hist. iv, p. 457, pl. 24, f. 3.—REEVE Conch. Icon. pl. 31, f. 188.—DESHAYES in Fér., Histoire, p. 51, pl. 130, f. 9, 10.—*B.* (*Amphidromus*) *atricallosus* MARTENS, Conchol. Mittheil., p. 130, 131; Journ. Linn. Soc. Lond., xxi, 1889, p. 163; and ?Ostas. Landschn. p. 77.—*B. perversus* MARTENS, P. Z. S. 1860, p. 9.—*Amphidromus perversus var. atricallosa* FULTON, Ann. Mag. N. H. (6) xvii, p. 69.—*Bulimus perversus* var., PFR. Monogr. iii, p. 309; Conchyl. Cab., *Bul.*, pl. 40, f. 10, 11.—?*A. atricallosus* SEMPER, Reisen, Phil., Landmoll., p. 147, pl. 16, f. 20 (teeth).—*Bulimus eques* PFR., Malak. Bl. iv, 1857, p. 158; Monogr. iv. 373; vi, 19.

Distinguished by its robust contour and blackish-brown parietal callus (whence the name *atricallosus*), but closely allied to *leucoxanthus*. It is apparently a coast species, ranging from Tavoy, in British Burma, to Salang Island and Penang. Semper doubts the identity of the specimens collected by him at Saigon, Cochin China, but gives no information about the shells. Pfeiffer, however, gives Cochin China as habitat of his *B. eques*, which is a synonym of *atricallosus*; and this lends probability to the statement of a more eastern distribution. Von Martens saw specimens in Schomburgk's collection at Bangkok, probably Siamese. The type is in the State Museum at Albany, N. Y., no. A6524.

Dr. Anderson collected 17 dextral and 4 sinistral examples in the

Mergui Archipelago; and the dextral form seems to be the prevalent one. A single black varix on the ventral side of the last whorl seems to be invariable, though it may not really be so. In one specimen before me there is a distinct white sutural band, as in *leucoxanthus*. The blackish parietal wall sometimes is overlaid with a whitish layer.

A. melanomma, *natunensis*, *leucoxanthus*, *atricallosus* and *aureus* may prove to insensibly grade into one another. The last name is prior.

B. eques Pfr. is according to Fulton a decorticated specimen of *atricallosus*. The description follows: Shell imperforate, ovate-conic, solid, striate and obsoletely decussated with spiral striæ, glossy, white. Spire convexly conic, somewhat acuminate, whorls 6, a little convex, the last a little shorter than the spire, slightly compressed at the base. Columella rather straightened. Aperture oblique, sinuate, half-oval; peristome white, the margins joined by a deeply entering blackish chestnut callus; right margin narrowly expanded, columellar margin much dilated above, adnate. Length 48, diam. 25, aperture inside 22 mill. Cochin China, Mus. Cuming. (*Pfr.*)

A. DAUTZENBERGI Fulton. Pl. 62, fig. 66.

"Shell dextral, oblong-conic, very narrowly umbilicated, slightly polished, of moderate solidity, whitish above, changing to greenish-yellow below, obscurely spirally striated; suture of last whorl slightly impressed and bordered by a narrow white band; whorls $6\frac{1}{2}$, the last obtusely angulated above the aperture at the periphery, last half indistinctly malleated; aperture semi-oval, white within; peristome moderately expanded, white, margins joined by a very thin callus; columella almost erect, rounded, widening at point of insertion. Alt. 42, diam. maj. 21 mill." (*Fulton.*) *Tonkin.*

A. dautzenbergi FULTON, Proc. Malac. Soc. Lond. iii, p. 303, fig. III (October, 1899).

"A single specimen only of this distinct new form, received with other shells from Tonkin. I have much pleasure in naming this species in honor of M. Ph. Dautzenberg." (*Fulton.*)

A. NIGROFILOSUS Rochebrune.

Shell nearly covered, perforate, ovate-pyramidal, sinistral, obsoletely striated, white, shining, obliquely painted with pale corneous

flammules; spire elongate, the suture very minutely crenulate; whorls 7, subconvex, the last 4 sutured with intense black, last whorl compressed at the base; aperture broadly subquadrangular, somewhat twisted at the columella; peristome straight, white, callous, expanded throughout; columellar margin strongly calloused, recurved, violaceous. Length 66, diam. 22, length of aperture 30, width 14 mill. (*Rochebr.*)

Mountains of Chaudoc (Dr. Harmand).

A. nigrofilosus Rochebr., Bull. Soc. Philomath. vi, 1881–2, p. 72.

Said by Mr. Fulton to be identical with *A. maculiferus* var. *gracilior;* if so, a Philippine shell must have become mixed with Harmand's Cambodian collection. See p. 132.

A. inversus (Müller). Pl. 56, figs. 91, 92.

Shell either sinistral or dextral, perforate, ovate-oblong, striatulate, slightly shining; *whitish, irregularly streaked with chestnut, the whole color abruptly becoming darker chestnut below the periphery;* the upper whorls whitish with a purple band above the suture. Whorls about 7, slightly convex. Aperture quite oblique, ovate, white within the outer lip, *the parietal wall dark brown* with a white marginal callus; peristome rather thick, white, reflexed, the *recurved edge brown, not adnate.* Columella straight and vertical; parietal callus moderately heavy.

Alt. 55, diam. 27, longest axis of aperture 26 mill.

Malay Peninsula (Wallace): *Malacca* (F. Jagor), *Singapore* (Martens, 'Magenta'). Sumatra (Hombron & Jacquinot), at the assistant residency *Agam,* on the west coast (Dr. Ludeking). Sunda Strait islands *Pulo Sangian and Rakata* (Zollinger). Borneo: *Coast of Sambas* (Hallier); *Smitau* on the Kapoeas River, and *Roema Manoeal* on the southern foot of Mt. Kenepai (Büttikoper); *Mt. Dadap* (Moret); *Sintang* (Goedhuis).

Helix inversa Mull., Verm. Terr. et Fluv. Hist., ii, p. 93, 1774. (Chemnitz, Conchyl. Cab., ix, pl. 110, f. 925, 926, and edit. nov., pl. 6, f. 1, 2).—Fer., Prodr., no. 414, exclusive of var.; Histoire, pl. 161, f. 1, 2.—*Bulimus inversus* Brug., Encycl. Méth., i, p. 315. —Lam., An. s. Vert., vii, p. 118; edit. Desh., viii, p. 224.—Mousson, Moll. Java, p. 107, exclusive of variety.—Pfr., Zeitschr. f. Malak., 1849, p. 133 (var. *a* and *e*); Monogr. iii, p. 318, excl. of var. B.—Martens, Ostas. Landschn., p. 337.—*Amphidromus in-*

versus Wallace, P. Z. S., 1865, p. 412.—Rochebrune, Bull. Soc. Philomathique, 1881–1882, p. 71.—de Morgan, Moll. terr. et fluv. de Pérak, Bull. Soc. Zool. de France, x, 1885, p. 387.—Schepman, notes from the Leyden Museum, xvii, p. 156 (1896).—Fulton, Ann. Mag. N. H. (6) xvii, p. 70.—*Helix recta* Mull., t. c., p. 93, and of Gmelin and Dillwyn.—*Bulimus perversus* var. δ Pfr., Monogr., ii, p. 38.—*Bulimus jayanus* Lea, Proc. Amer. Philos. Soc., ii, 1841, p. 31; Obs. Gen. Unio, iv, p. 2.—Pfr., Monogr., ii, p. 229.—*Bulimus contusus* Reeve, Conch. Icon., pl. 37, fig. 220 (Sept., 1848).—Mousson, Moll. Java, p. 109.—*Canistrum contusum* Fld., Verh. Zool.-bot. Ges. Wien, xix, 1869, p. 874 (Java).—*Bulimus elongatus* Hombron & Jacquinot, Voy. Pol Sud, pl. 8, f. 3, 4 (1848–1853).

The typical form of this species is usually sinistral, though dextral shells are on record. It is elongated, with rather slender spire, rather sparse streaks of varying shades of chestnut on a whitish ground, *darker below the periphery.* The edge of the lip is brown, recurved but *not aduate;* and the parietal wall is dark within, with a marginal band of white callus. *A. atricallosus* is not unlike *inversus* in many respects, but I can see no sufficient reason for uniting the latter with *A. perversus*, as some authors have done.

The name *inversus* refers to the reversed coil of the whorls, as opposed to *recta* Müll., a dextral form of the same species, in all probability, though positive information on *H. recta* is lacking.

A. inversus has been recorded from Java ('Novara' exped.) and from Cambodia and Siam (Pavie; Morlet in Journ. de Conchyl., 1889, p. 127). Morlet mentions a var. *alba globosa* from Tram Khna, between Kampot and Pnom-Penh, and a var. *curta* from Battambang, Siam. Rochebrune identifies specimens collected by Dr. Harmand on Poulo-Condor as *inversus.* The specific identity of these forms calls for further confirmation. M. de Morgan did not encounter *inversus* in Perak.

Of the specimens collected by the Dutch Borneo Expedition, Schepman says that from Sambas is sinistral, the majority of the others dextral; nearly all are rather small, measuring only 43½ and 45 mill.

Var. andamanensis ('Mousson' Pfr.). Pl. 56, figs. 94, 95, 96, 97.

Sinistral, nearly covered perforate, conic-ovate, the *spire rather*

straightly conic, not swollen. *Ground-color whitish, the base chestnut or tawny, and with a band of the same color below the suture*; heavily streaked with chestnut, the streaks intermingled dark and lighter, and *intensified on the subsutural band and the base*. Whorls 6–6½, but slightly convex. Aperture white within, the edge of the lip dark; parietal wall blackish-chestnut with a marginal white callus.

Alt. 38, diam. 23½, aperture 20½ mill.

Alt. 45, diam. 24½, longest axis of aperture 23 mill.

Alt. 33, diam. 20½ mill.

Bulimus andamanensis Mousson MSS., Pfr., Novitates Conch. iv, part 39, p. 35, pl. 116, f. 7–10 (1871); Monogr. viii, p. 39.—*Bulimus inversus* Müll., Gassies, Faune Terr. Nouvelle-Calédonie i, p. 50, pl. 3, f. 3, 4; *Cf.* Crosse, J. de C., 1894, p. 171.

This is a small form of *inversus* with certain peculiarities of the more intense color pattern which probably define a geographic race. It was originally supposed to be from the Andaman Is., but no *Amphidromus* has been found there by recent collectors. According to Fulton, "the small form has been found at Sarawak and Sirhassen (Natuna Is.) by Mr. Everett."

Subsp. annamiticus (Crosse & Fischer). Pl. 56, figs. 98, 99, 100.

Dextral, imperforate, with *thick, slightly convexly conic spire, which is pink above*, with a purple suprasutural band near the apex. Whorls 7–7½, the earlier 2 convex, *several succeeding whorls almost flat, slightly marginate above the sutures;* the last 2 whorls more convex, pale brown with some oblique chestnut streaks, the last whorl abruptly becoming darker chestnut beneath; one varix or none. Aperture white within, the recurved edge of the peristome dark. Parietal callus white, becoming thin and showing the chestnut color of the base within.

Alt. 50, diam. 27, longest axis of aperture 26½ mill.

Cambodia: *Vicinity of the town of Saigon* (Michau, Counillon), *and the Fuyen-Moth district*, on trees (Le Mesle, A. Michau); everywhere in Cambodia, on trees bordering the rice fields (Pavie). Annam: *Boloven Plateau,* in western Annam, on the left bank of the Mekong (C. Roebelen).

Bulimus annamiticus Crosse & Fischer, Journ. de Conchyl. 1863, p. 357; 1864, p. 329, pl. 12, f. 8.—Pfr., Monogr. Hel. Viv., vi, p. 19.—Morelet, Series Conchyliologiques iv, p. 261 (1875).

—Mabille & Le Mesle, J. de C., 1866, p. 128.—*Cochlostyla annamitica* Tapparone-Canefri, Zool. Magenta, p. 81 (1874).—*Amphidromus annamiticus* Morelet, Journ. de Conchyl. 1889, p. 126.—Ancey, Ann. Mus. d'Hist. Nat. Marseille, Ser. 2, Bulletin i, p. 141.—*A. inversus subsp. annamiticus* C. & F., Mlldff., Nachbl. 1898, p. 73.

Well distinguished from typical *inversus* by the thick spire of almost flat whorls, faintly margined but not impressed at the sutures. The specimens examined by Crosse and Fischer and myself are dextral, but a single sinistral example is on record. It seems to be a well marked subspecies, confined so far as known to the lower Mekong drainage in lower Cochin China and Cambodia.

A color-variety *roseotincta* of von Möllendorff is without the dark border above the sutures of the early whorls, which are of a uniform rose color. (Nachrbl., 1898, p. 73, and Fulton, *l. c.*, p. 70, 1896.)

A. comes (Pfeiffer). Pl. 57, figs. 1–5.

Shell dextral or sinistral, nearly imperforate, ovate-conic, solid, striatulate, glossy. Spire almost straightly conic, rather acute; whorls [$6\frac{1}{2}$ to] 7, a little convex, the earlier 5 flesh-tinted, the upper one black-margined above the suture, last 2 whorls buff, variously banded, streaked or clouded with livid-greenish, [or whitish fleshy above, becoming banded with reddish-brown along the suture both above and below, *interrrupted on the penult. whorl by a broad light yellow varix* or two, apical whorl white with a purple band above the suture; the last two whorls *mingled yellow and greenish, clouded or banded with reddish brown shading to olive; a broad yellow stripe behind the outer lip.* Or with the spire similarly colored, the last two whorls may be *bright yellow*, unicolored except for narrow olivaceous or brownish streaks; apex sometimes wanting the dark band]. Last whorl a little shorter than the spire, rotund below. Aperture oblique, irregularly semioval, [faintly] subangulate at base, white within; peristome spreading and a little reflexed [the edge white, recurved but not appressed]; parietal callus white, entering; columella rather thick, subvertical, white.

Alt. 46, diam. 27, longest axis of aperture 25 mill.

Alt. 51, diam. 30, longest axis of aperture 27 mill.

Alt. 44, diam. 25, longest axis of aperture 23 mill.

Cambodia (Pfr.): in the pepper plantations of *Kampot, Compentra,*

in southern Cambodia near the Ha-tien frontier; *Tram-Khna* betw. Kampot and Pnom-Penh; *Kebal-Khmoch*, *Kassan-Pno* (Pavie). Cochin China (Morelet). Siam: *environs of Battambang* (Pavie).

Bulimus comes Pfr., P. Z. S. 1861, p. 193; Novit. Conch. i, p. 311, pl. 75, f. 10, 11; Monogr. vi, p. 19.—Martens, Ostas. Landschn., p. 78.—*Amphidromus comes* Pfr., Morelet, Journ. de Conchyl. 1889, p. 126.—Fulton, Ann. Mag. N. H. (6), xvii, p. 72.—Fischer, Bull. Soc. d'Hist. Nat. d'Autun, iv, 1891, p. 115.—*Cochlostyla comes* Schaufus in Paetel's Catal., p. 78.—*B. perversus var. comes*, Morelet, Sér. Conch. iv, p. 258.

? *Bulimus virescens* Swainson, Catal. of the rare and valuable Shells which formed the celebrated collection of the late Mrs. Bligh, Appendix, p. 13 (1822); Exotic Conchology (edit. 2), p. 37.—*Bulimus citrinus* var., Swainson, Zool. Illustr. iii, pl. 166, f. 1, 2, 3 (1822–3).

The typical form of *comes* (well named the *companion*, for its intimate relations with several other species) is slightly perforate, with recurved but not adnate lip, peculiarly blended greenish and yellow coloring on the later whorls, or wanting the green; the flesh tint of the spire arrested by a wide but not distinctly defined yellow varix on the next to the last whorl, with a wide stripe of the same behind the outer lip. There is no white zone below the suture, such as marks various forms of *A. aureus*. Pfeiffer's description is given above, supplemented with bracketed notes on the series of specimens before me.

Pl. 57, figs. 1, 2, are from Pfeiffer; fig. 3 is a specimen from Cochin China (from Morelet); fig. 5 is a dextral shell from Siam, and fig. 4 a yellow individual from Cambodia.

I have not much doubt that Swainson's *Bulimus virescens* was a specimen of *comes*, but until all doubt is removed, it will be better to retain the well established name.

Subsp. polymorphus (Tapparone-Canefri), Pl. 57, figs. 6–10.

Shell either dextral or sinistral, usually imperforate and larger than *comes*, solid and strong; *greenish-yellow, with reddish brown flames on the spire, changing on the last whorl to greenish or brownish-green stripes which do not quite reach the suture above*, or becoming merged in a general dusky greenish-yellow color; *almost always with a pale streak behind the outer lip; one or two black-brown varice*

developed, rarely wanting; apex white or yellowish. Whorls 7, the earlier without streaks or bands. Outer lip reflexed, recurved, *adnate to the back of the lip or imperfectly so*, the adnate edge frequently brown or even blackish bordered. Parietal and columellar callus pure white throughout, broadly spreading, extending well downward; columella straight, or somewhat folded, stout.

Alt. 55, diam. 29, longest axis of aperture 30 mill. (dextral.)

Alt. 56, diam. 27½, longest axis of aperture 27½ mill. (sinistral).

Alt. 60, diam. 29, longest axis of aperture, 30 mill. (dextral).

Alt. 53, diam. 30, longest axis of aperture, 27½ mill. (sinistral).

Alt. 44, diam. 23½, longest axis of aperture 23 mill. (sinistral).

Singapore ("Magenta" voyage); *Saigon* (Counillon) *and Prov. Baté, Cochin China.*

Cochlostyla polymorpha T.-C., Zoologia del Viaggio intorno al Globo della R. Fregata Magenta, Malacologia, p. 82, pl. 2, f. 4 (1874); *C. polimorpha* in expl. of plate.—*Bulimus polymorphus* Pfr., Monogr. viii, p. 23.—*Amphidromus polymorphus* de Morgan, Bull. Soc. Zool. Fr. 1885, p. 387.—Fulton, Ann. Mag. N. H. (6) xviii, 71.—Ancey, Ann. Mus. d'Hist. Nat. Marseille, Sér. 2, Bull., i, p. 141.

Of 13 specimens before me, 8 are dextral. Canefri based the species upon 3 specimens, two of them sinistral. I very much doubt the locality "Singapore;" probably the original specimens were brought there from Cochin China, which is the locality of some five lots of the species I have seen from various sources. It differs from *comes* in being more solid, in the color-pattern, especially the absence of spiral bands on the spire, and in having black varices, also in the more or less adnate outer lip. In this respect it stands between *comes* and *dohrni*.

When denuded of cuticle the markings are seen to be reddish or purplish brown; and the same color is prominent inside the aperture in young shells. Each varix is usually preceded by a yellow and followed by a whitish stripe, and usually the reddish flammules are narrower and closer before than after a varix. The last whorl occasionally has a dark spiral band, or traces of a pale peripheral band. There seems to be always a small white basal patch, but on some shells the pale stripe behind the lip is wanting, though it is as conspicuous in some others as in *A. comes*.

Var. *polymorphus* was figured in Férussac, pl. 161, f. 3, 4, but ap-

parently not referred to in the text. Figures 9, 10 are Canefri's originals, 6–8 representing specimens in the collection of the Academy.

A. DOHRNI (Pfeiffer). Pl. 58, figs. 11, 12, 13; pl. 59, figs. 24–27.

Shell either dextral or sinistral, ovate-pyramidal, imperforate, rather solid, smoothish, lightly striatulate. *Bright straw or greenish-yellow, the base of the last whorl green*, or in some shells the darker color invades most of the last whorl or even the penultimate whorl; shell-substance purple under the green, white under the yellow. One or two black varices usually present. Spire high-conic, the apex white or yellow. Whorls 7, slightly convex. Aperture oblique, purplish and white inside; peristome white, somewhat thickened, revolute and *closely adnate upon the reverse of the lip, the adnate edge conspicuously black-bordered*. Parietal callus rather strong, white.

Alt. 45, diam. 24, longest axis of aperture 20½ mill.

Alt. 39, diam. 23, longest axis of aperture 19½ mill.

Alt. 47, diam. 25, longest axis of aperture 23 mill.

Cochin China (Pfr., coll. A. N. S.); *Poulo-Condor* (Morelet).

Bulimus Dohrni PFR., P. Z. S. 1863, p. 525; Novit. Conch. p. 312, pl. 75, f. 12, 13; Monogr. vi, 20.—*B. perversus var. dohrni* MORELET, Sér. Conchyl. iv, p. 260.—*A. dohrni* FULTON, t. c., p. 72 (exclusive of synonym).

The completely adnate, black-edged lip reminds one of *A. perversus* and *interruptus*. The typical form is rather pyramidal, with only the base green (pl. 59, figs. 26, 27), and is usually dextral; but much shorter specimens than those figured are before me, both dextral and sinistral.

A more solid, more ovate form also occurs (pl. 58, figs. 11, 12, 13) in which the green color is more extended, and sometimes becomes brownish on the penultimate whorl; there is often a dark line along the edge of the parietal callus, and as in the typical shells it coils either way, and varices may be present or absent. These shells approach certain forms of *A. comes*, though the development of the lip and brighter yellow of the spire sufficiently distinguish them. The name is to honor Dr. Anton Dohrn.

The quotation of *A. interruptus infraviridis* as a synonym of *dohrni* by some authors, is an error. There is no direct connection between them.

A. MUNDUS (Pfeiffer). Pl. 61, figs. 57, 58, 59.

Shell imperforate, ventricose-ovate, rather solid, nearly smooth, uniform white, glossy, without cuticle. Spire convexly conic, the apex somewhat teat-shaped; suture simple, whorls 6, a little convex, the penultimate one subangulate, last whorl slightly shorter than the spire, columella vertical, somewhat compressed. Aperture oblique, oval, somewhat effuse at base; peristome slightly thickened, narrowly expanded and reflexed, the margins joined by a thin callus; columellar margin dilated, adnate. Length 35, diam. 19, aperture 17 mill. long inside (*Pfr.*).

Singapore (Gruner. type); *Borneo?* (Cuming).

Bulimus mundus PFR., Zeitschr. f. Malak., 1853, p. 57; Conchyl. Cab., p. 261, pl. 70, f. 21, 22; Monogr., iii, p. 651; viii, p. 24.—*Amphidromus mundus* Pfr., FULTON, Ann. Mag. (6), xvii, p. 71.—This work, vol. viii, pl. 11, f. 20 (not good).

I have given Pfeiffer's description and figures (f. 57, 58), as well as his apochryphal localities. The specimens before me agree with his, part being from an unknown locality, part marked "Philippines." They are either dextral or sinistral, glossy white throughout, rather swollen, the subangular periphery of the penult. whorl visible at the suture. The lip is moderately thickened on its face, and is narrowly recurved but not adnate. From the whiteness of the parietal wall I conclude that there is no colored cuticle; in fact the specimens before me have no appearance of being denuded of their cuticle. Pfeiffer mentions larger specimens, "giganteus, dextrosus, long. 50, diam. 23 mill. Nova Caledonia? Mus. Cuming;" and these are also probably what Fulton refers to. The name alludes to its clean, white appearance.

A. METABLETUS Möllendorff.

Shell imperforate, dextral or sinistral, ovate conic, rather solid, decussated throughout with minute but distinct spiral lines, scarcely shining; white or yellow, uniform or ornamented with three brown bands, at suture, periphery and around the columella. Spire almost regularly conic, the sides nearly straight, apex obtuse. Whorls $7\frac{1}{2}$, the upper 5 nearly flat, lower ones a little convex, separated by a narrowly pale margined suture, the last whorl about two-fifths the total alt. Aperture moderately oblique, oval, slightly excised, somewhat effuse at base; peristome moderately expanded, thickened, reflexed,

almost revolute. Columella straightened, hardly twisted, forming an indistinct angle with the basal margin. (*Mlldff.*)

Alt. 49, diam. 26; length of aperture 23, width outside 17, inside 11.5 mill.

Alt. 43.5, diam. 23.5; length of aperture 21, width outside 16.5, inside 11 mill.

Annam: "*Mother and child*" *mountain* (Roebelen).

A. metabletus Mlldff., Nachrbl. d. d. Malac. Gesellsch. xxxii, p. 22 (Feb., 1900).

"In this beautiful form I at first thought to recognize *A. cochinchinensis* Pfr., known to me by description only; but that is decidedly narrower, 39 by 17 mill., the ratio of length to breadth being 100 : 43.6, while our new species has the ratio 100 : 53. The spire is not so straightly conic, the sides being distinctly convex in *cochinchinensis*, and moreover Pfeiffer calls his species smooth and glossy, while *A. metabletus* is distinctly striate and rather dull, and also has fine, close spiral lines. It has also a wider peristome, with thicker lip, and recurved. Mr. Fulton has been so kind as to compare with the type of *A. cochinchinensis* in the British Museum, and confirms the distinctness of the two, especially on account of the more slender, almost cylindrical contour of Pfeiffer's species. The latter has spiral sculpture, but it is hardly visible because the cuticle is nearly worn off.

Of color- and band-variations it occurs (*a*) uniform, either pure white or yellow, and (*b*) banded, on a white or yellow ground." (*Mlldff.*)

A. INGENS Möllendorff.

Shell shortly rimate, dextral or rarely sinistral, ovate-conic, solid, lightly plicate-striate, decussated with minute spirals; whitish? Spire high conoid, with convex sides, the apex rather acute. Whorls 7, the upper nearly flat, impressed at the sutures, *the last encircled by three elevated girdles*, of which the median one is wider and higher, below the middle excavated in a rather deep furrow, generally malleated in places. Aperture but little oblique, subauriform, the base rather effuse; peristome widely expanded, strongly thickened, columella nearly straight, strongly thickened with callus above, forming a rather distinct angle with the basal margin; margins joined by a very thick callus. (*Mlldff.*)

Alt. 75, diam. 40 mill.

Alt. 61, diam. 47.5 mill.

Annam: "*Mother and child*" *mountain* (Roebelen).

A. ingens Mlldff., Nachrbl. xxxii, p. 23 (Feb., 1900).

"This very remarkable form exceeds the largest species known to this time, *A. cambojiensis* Rve. in size, and is very notable for the singular girdling with three strongly raised welts, and the deep furrow below the middle welt. This structure is lost upon the penultimate whorl, and is represented on the earlier whorls only by a gradually weakening impression along the suture. The rather prolonged base of the mouth somewhat recalls *A. inauris* Bttg. of Java. Nothing certain can be said of the color, but it appears to be pure white. The specimens, though obviously collected alive, are partly covered with algæ, and show no trace of a colored cuticle." (*Mlldff.*)

A. COSTIFER Smith. Pl. 59, figs. 22, 23.

Shell rimate, ovate, dextral, solid; whitish, the last whorl more or less streaked and variegated with purple-brown above. Whorls 6, a little convex, separated by a slightly oblique suture, striated with growth-lines (rugose on the last whorl), cut by obsolete spiral striæ, the last whorl having *a very oblique, strong white varix* on the back. Aperture widely subauriform, half the total length of the shell, whitish within; peristome white, thickened, the right margin slightly reflexed, columellar margin widely dilated, joined to the lip by a very broad, thick, white callus; columella subperpendicular, slightly twisted. Spire conoid, with convex outlines. Length 47, diam. 24, aperture inside 21 mill. long. (*Smith.*)

Annam: "*dans les montagnes boitées du Huyen de Triphuoc, province Binh-dinh*" (E. Eudel).

Amphidromus costifer E. A. Smith, Proc. Malac. Soc. Lond., i, p. 12, figs. in text (1893).—Fulton, Ann. Mag. N. H. (6), xvii, p. 91, pl. 7, f. 6, 6*a* (1896).

"This species is remarkable for its short, ovate form, the somewhat rugose lines of growth, and its irregular auriform aperture; but especially for the varix or former lip on the back of the body-whorl. This apparently indicates a period of arrested growth, probably of the previous year. It occurs in all the specimens as yet known, seven in number, with the exception of one of immature growth. This is in nice fresh condition, and shows that the color of the species is much brighter in the young shells. Beneath the suture the whorls

are faintly margined with pale yellow, and between the varix on the back of the last whorl and the lip the surface is whitish, the purple-brown markings which occur on the rest of the whorl ceasing at the varix. This species sometimes attains larger dimensions than those given above, the finest specimen having a length of 54 mill." (*Smith.*)

A. COCHINCHINENSIS (Pfeiffer). Pl. 54, fig. 69.

Shell imperforate, fusiform-ovate, solid, smooth, glossy, pale sulphur-colored or whitish. Spire a little convexly turreted, the apex somewhat obtuse, suture light, pale. Whorls 6 to 7, the upper a little flattened, the following more convex, last whorl about two-fifths the total length, tapering at base, subcompressed. Columella cord-like, slightly twisted. Aperture a little oblique, elliptic-oval; peristome somewhat thickened, the right margin narrowly expanded, columellar margin dilated, adnate. Length 39, diam. 17, aperture 18–19 mill. (*Pfr.*). *Cochin China* (Ptr.).

Bulimus cochinchinensis PFR., P. Z. S., 1856, p. 331; Monogr. iv, p. 373.—*Amphidromus cochinchinensis* Pfr., FULTON, Ann. Mag. N. H. (6), xvii, 1896, p. 69, pl. 6, f. 6.

Mr. Fulton has figured the type of this species. He remarks: "A cylindrical elongated form of a uniform pale yellow color. May possibly prove to be but a variety of *perversus*."

A. CAMBOJIENSIS (Reeve). Pl. 59, fig. 32.

Shell dextral or sinistral, oblong-conic, solid, striatulate; whitish, irregularly marbled with flames and streaks of brown. Spire thick, terminating in a rather obtuse cone. Whorls 8, the upper ones flattened, last 3 more convex, the last whorl about equal to three-sevenths the length, distinctly striate. Columella thick, somewhat twisted, white. Aperture oblique, oval, *deep purple inside*, glossy; peristome thickened, expanded, *white*, the margins joined by a thick, white callus. Length 70, diam. above aperture 32, aperture 33 mill. long (*Pfr.*).

Brelum, in the Stiengs country, or Moï, on the eastern frontier of French Cochinchina, 60 leagues north of Saigon (Morelet) *?Cambodia* (Mouhot).

Bulimus cambojiensis REEVE, Ann. Mag. N. H. (3), vi, p. 204 (Sept., 1860); and in Mouhot's Travels in the central parts of Indo-China, etc., ii, p. 185.—PFR., Malak. Blätter, 1861, p. 11; Monogr.

vi, p. 16.—*B. perversus* var. *B. cambodiensis* Rv., Morelet, Sér. Conch. iv, p. 260 (1875).—*A. cambojensis* Reeve, Fischer, Soc. d' Hist. Nat. d' Autun, 4me Bull., 1891, p. 114.—*A. cambojiensis* Rve., Fulton, t. c., p. 91, pl. 7, f. 7.

A very large, solid species, with pure white peristome and parietal callus, and purplish within the mouth. Morelet remarks that of seven specimens, four were dextral and three sinistral; the smallest one measuring 64 mill. long. According to the same author, the species does not occur in Cambodia.

I do not remember that it has been noticed that the wood-cut given for *Helix cambojiensis* in Mouhot's Travels, ii, p. 184, is *Camæna illustris*.

A. placostylus Möllendorff.

Shell dextral, not rimate, ovate-oblong, solid, lightly plicate-striate; olive-brown, with wide brown streaks. Spire moderately elevated for the genus, swollen-conoid. Whorls $6\frac{3}{4}$, a little convex, impressed below the margined suture, the last whorl quite convex, about four-sevenths the total alt. of shell. Aperture moderately oblique, ample, subauriform, the peristome rather broadly expanded and reflexed, thick lipped; columella nearly straight, forming an obtuse angle with the basal lip, the callus widely appressed. Alt. 70, diam. 41, length of aperture 42, width, with callus, 31, inside $17\frac{1}{2}$ mm. (*Mlldff.*)

Phuc-son, Annam.

A. placostylus Mlldf., Nachrbl. d. D. Malak. Ges., Oct., 1900, p. 132.

This fine species, next to *A. ingens* the largest of the genus, recalls *Placostylus* in its general form. I know of no other *Amphidromus* nearly allied to it, but evidently it belongs in the same group as *A. ingens*.

There are numerous citations in the literature of the mollusks of Indo-China, of southern, insular species, such as *A. perversus*, *chloris* and *sultanus*, from localities in the Malay Peninsula or Cambodia. It is almost certain that these were based upon species different from those of Java, Celebes, etc.; and probably the specimens would prove identical with some of the known Cambodian or peninsular species if they could be re-examined in the light (or darkness) of present knowledge. The chief citations of this sort here follow:

"*Bulimus perversus* L.," MABILLE and LE MESLE, J. de C. 1866, p. 129. Poulo Condor and Saigon; with the following varieties: *ventricosa*, shell short, with the last whorl extremely obese, shell thick. *Elongata*, shell thick, narrow, lengthened, nearly subulate, the whorls of the spire a little swollen. *Viridescens*, shell of the typical form, with inconspicuous striæ, of a deep green color with yellowish zones; the summit reddish violet.

Littoral of Cochin China and Siam MORELET, Sér. Conchyl. iv, p. 257.

Perak (P. Townsend); Siam (Richthofen); Saigon and Poulo Condor, French Cochin China (Michau); Singapore (J. Irwing). CROSSE, Jour. de Conch. 1879, p. 337.

Throughout the territories of Perak and Patani, from the plains to 1500 meters; either sinistral or dextral, and very often white, but the yellow variety often met with. J. DE MORGAN, Bull. Soc. Zool. France, 1885, p. 386.

Luang-prabang, Laos; dextral, imperforate, of a light yellow color with white, relatively oblique aperture, and quite short contour. ANCEY, Ann. Mus. d'Hist. Nat. Marseille (2), i, p. 133, 1898.

"*Bulimus sultanus* Lam.," MABILLE & LE MESLE, Journ. de Conchyl., 1866, p. 129. Saigon; Poulo-Condor. Also MORELET, Sér. Conch. iv, 258, Cochinchina (Vesco).

"*Bulimus chloris* Reeve," MABILLE & LE MESLE, Journ. de Conchyl., 1866, p. 129. Saigon and Poulo-Condor (Le Mesle). MORELET, Sér. Conch. iv, p. 259. Saigon. J. DE MORGAN, Bull. Soc. Zool. de France, x, 1885, p. 387 (Larut plain and Kinta valley, Perak); *cf.* MLLDFF., P. Z. S., 1891, p. 336.

"*A. perversus* var. *chloris*" FULTON, Ann. Mag. N. H. (6), xvii, p. 67 (Malay Peninsula).

7. *Group of A. schomburgki.*

Rather solid species, either dextral or sinistral, with dark or brilliant coloring, the peristome rather wide, and purple or pink. Distribution, Burma, Siam and Annam, to the upper Mekong Valley.

A. MONILIFERUS (Gould). Pl. 62, figs. 73, 74.

Shell conic-oblong, usually sinistral, smooth; ashen buff with longitudinal flames, a linear sutural band and an interrupted band below the suture, of brown; umbilical tract brown, divided by a buff line. Whorls 7, the last subcarinated. Aperture subovate, angulate

at the base, subeffuse; lip reflexed, reddish-purple, dilated at the columella; throat purple. Length 1.2, width .7 inch. (*Gld.*)

Tavoy, Burma (Rev. F. Mason); *Martaban* (W. Theobald); Yangtaw, Tenasserim (W. Theobald).

Bulimus moniliferus Gld., Proc. Bost. Soc. N. H. ii, p. 99 (1846): Otia Conch., p. 198.—Pfr., Monogr., iv, p. 384 (exclusive of synonymy); vi, 32.—*Amphidromus moniliferus* Gld., Nevill, Handlist Moll. Ind. Mus., i, p. 126.—Mlldff., P. Z. S., 1894, p. 150.—Fulton, t. c., p. 90, pl. 7, f. 9.—*Bulimus theobaldianus* Benson, Ann. and Mag. Nat. Hist. (2), xix, p. 329 (April, 1857).—Hanley & Theobald, Conch. Indica, p. xi, footnote 8, and p. 10, pl. 19, f. 10.—Pfr., Monogr. iv, p. 473.—*A. schomburgki* var. *theobaldi* Bs., Nevill Handlist Moll. Ind. Mus., i, p. 126.—*A. theobaldianus* Bs., Theobald, Journ. Asiatic Soc. of Bengal, xlv, pt. 2, p. 187, pl. 14, f. 8 (1876).

"Differs from *B. contrarius* and *B. lævus* Müll., by its angular aperture, and the color of its lip and throat. The interrupted line just in front of the suture, exists in all the specimens I have seen. It does not always occur reversed. Compare *B. theobaldianus*" (*Gld.*).

The identity of *moniliferus* (fig. 73) with *theobaldianus* (fig. 74,) hinted by Gould, Pfeiffer, and the authors of the *Conchologia Indica*, is confirmed by Fulton. It is a smaller shell than others of the group. Dr. von Möllendorff reports a single dead specimen which seems to agree with this species, from the Samui Islands, near the neck of the Malay Peninsula on the east side.

A. moniliferus evidently stands near *A. glaucolarynx*.

A. glaucolarynx (Dohrn). Pl. 60, fig. 49.

Shell (dextral or sinistral) rimate, ovate-turreted, rather thin, smooth, buff under a corneous cuticle, *broadly streaked and banded with blue-brown or purple-brown.* Spire conic, rather obtuse, purple, rarely livid; suture submargined, broadly encircled with white. Whorls 6 to 7, a little convex, the last three-ninths the total length, the base subangular and encircled by a wide straw-colored band. Aperture oblique, semi-oval, effuse at base, *violaceous within; peristome expanded, violaceous*, the margins joined by a thin callus (*Dohrn*).

Length 45, diam. 17 mill., aperture 17½ mill. long inside (Dohrn).

Siam (Cuming coll.): "*Pexaburi*" (Bocourt).

Bulimus glaucolarynx Dohrn, P. L. S., 1861, p. 207, pl. 26, f. 7. —Pfr., Monogr. vi, p. 31.—Morelet, Sér. Conchyl. iv, p. 264.—*Amphidromus glaucolarynx* Rochebrune, Bull. Soc. Philomath, vi, p. 71.—*A. glauco larynx* Dohrn, Fulton, t. c., p. 90.—*Bulimus schomburgki* var. *fasciatus* Martens, Ostas. Zool., p. 80, pl. 21, f. 1*a*, 1*b* (1867).—*A. glaucolarynx* var. *fasciata* Mart., Fulton, t. c., p. 90, pl. 7, f. 3.

The dark interior and lip are doubtless constant characters. Fulton mentions a specimen in the British Museum 48 mill. long. A young shell before me (fig. 45) has the last whorl olive-brown, with a bright blue-green sutural border edged below with white, and a buff umbilical patch. The spire changes to a pink tone, the earlier whorls deep pink, paler below the sutures, the apex purplish. There are some darker streaks on the spire, and some early whorls have an interrupted brownish line below the suture.

Form *fasciatus* (Martens). Pl. 60, figs. 46, 47, 48. Greenish-yellow with broad brown streaks; a white or light-green band at the suture, and usually a second along the periphery of the last whorl. Peristome between rose red and violet; whorls but little convex (*Mart.*).

Length 37, diam. 20, alt. of aperture 18 mill.

Length 34, diam. 20, alt. of aperture 16 mill.

Siam: *Petshaburi* (Martens)

Scarcely distinguishable from the typical form except in the shorter contour and smaller size. The localities given "Pexaburi" and "Petshaburi" are merely variations of spelling for a place near the head of the Gulf of Siam, on the west side, sometimes spelled Phayt-che-booree.

Var. perrieri Rochebrune.

Dr. Jousseaume compared a specimen of *fasciatus* with the type of *A. perrieri*, for Mr. Fulton, and stated that he could not separate them. The description of *perrieri* follows: Shell sinistral, elongate-conic, very solid, delicately striatulate, painted with spaced, wide, square spots arranged in two spiral series. Spire elongate, the vertex rather acute, reddish. Whorls 7, convex; suture deep, blue-zoned. Last whorl elongate, half the length of the shell, the base with two wide violet-blue bands. Aperture narrow, long, somewhat narrowed anteriorly; peristome white, inflexed, somewhat calloused;

columellar margin straight. Length 38, diam. 14, length of aperture 17, width 9 mill (*Rochebrune*).

Cambodia: *Forests of Prek-Scholl*, south of Cratate (Dr. Harmand).

The biserial arrangement of spots and white peristome do not agree well with the Siamese species; more information is needed.

A. SCHOMBURGKI (Pfeiffer). Pl. 59, fig. 30.

Shell subimperforate, dextral or sinistral, solid, striatulate; *green with darker streaks* when fresh (violaceous when worn), the apex purple-black. Spire conic, the apex rather acute. Whorls 7, a little convex, the upper ones banded with violaceous, last whorl shorter than the spire, tapering at base. Columella inflated, somewhat straightened, violaceous. Aperture a little oblique, truncate-oval, white within; *peristome thickened, reflexed, lilac colored*, the margins joined by *a blackish-chestnut parietal callus;* columellar margin dilated, reflexed and overhanging, subadnate. Length 48, diam. above aperture 23, aperture inside 21 mill. long. (*Pfr.*)

Siam: *Srakao; mountains of the Elephant chain*, on bamboos (Pavie).

Bulimus schomburgki PFR., P. Z. S., 1860, p. 137, pl. 51, f. 9; Malak. Blätter 1861, p. 12; Monogr. vi, p. 18.—MORELET, Sér. Conch. iv, p. 262 (includes *B. crossei*).—MARTENS, Ostas. Zool. ii, pp. 79, 80, with varieties *legitimus* (= typical *schomburgki*), *crossei*, *mouhoti*, *fasciatus*.—*Amphidromus schomburgki* Pfr., MORLET, Journ. de Conchyl. 1889, p. 127.—FULTON, Ann. Mag. N. H. (6), xvii, p. 90 (1896).—*Bulimus crossei* PFR., Journ. de Conchyl. 1862, p. 43, pl. 5, f. 1; Monogr. vi, p. 26.

The typical *schomburgki* is "a stout shell with a well-developed and thickened lip, the last two whorls almost covered with oblique bright green stripes; lip, columella and callus of a purple color" (*Fulton*). It was named for Sir Robert Schomburgk, Her Majesty's Consul-General to Siam, 1857–1864, who first obtained specimens.

Var. *crossei* Pfr. Pl. 59, fig. 31.

Roseate under a fugacious greenish cuticle; outer lip violet, columella and parietal wall dark brown. Length 37–35½ mill. It occurs both dextral and sinistral. Siam. The type was in coll. Bernardi.

A. HÆMATOSTOMA Moellendorff.

Shell imperforate or rimate, sinistral, ovate-conic, rather solid,

delicately striatulate, glossy. Whorls $6\frac{1}{2}$–7, a little convex, the upper 3 punctate-granulate, the last somewhat inflated. Aperture rather oblique, subauriform, the peristome broadly expanded, a little reflexed, labiate, *bright purple*, outwardly margined with black; columella twisted, excavated above, broadly appressed, joined with the outer margin of the lip by a broad purple callus. Alt. 37, diam. $20\frac{1}{2}$, length of aperture 19, width 14 mill. (*Mlldff.*)

Boloven Plateau, in western Annam, on the left bank of the Mekong (C. Roebelen).

Amphidromus hæmatostoma Mlldff., Nachrbl. d. Malak. Ges., xxx, p. 74 (June, 1898).

Von Moellendorff records two color-forms, of which the green one may be considered typical.

"*A. viridis.* Shell green, becoming pale above, with a narrow dark line at the suture and a slightly wider yellow band disappearing above; the early whorls whitish, the last one with a rather wide bright yellow zone around the columella.

"*B. varians.* Shell bright yellow, the upper 3 whorls pale reddish, succeeding whorls with very wide, curved, chestnut streaks, last whorl uniform yellow.

"There lie before me three entirely similar examples of the green, two of the yellow form. Notwithstanding the conspicuously diverse color and pattern, they belong together specifically, for the contour, the characters of the aperture and all the rest are quite identical. By the fine blood-red lip, which especially in the green form contrasts beautifully with the ground-color, it certainly belongs to the group of *A. schomburgki*, with which it also shares the finely punctate embryonal whorls; but still in form, color and marking they are very different." (Mlldff.)

A. laosianus Bavay. Pl. 62, figs. 60, 61.

Shell either sinistral or dextral, oblong-conic, imperforate. Whorls $7\frac{1}{2}$, a little convex (the last more so), joined by a distinct, slightly margined suture, which is sometimes black-bordered on the earlier whorls, sometimes not bordered, or with a white sutural band on the last whorl; longitudinally minutely striate; the first ones of a buff-white tint, two or three later whorls closely striped longitudinally with brown, the stripes of unequal intensity, extending to the suture; last whorl with a brown varix-band. Aperture oval, long, angular

above, rose colored inside. Columella a little twisted, brighter rose tinted; peristome reflexed, roseate, the ends joined by a rose-tinted callus. Length 52, diam. 25. aperture 24 mill. (*Bavay*).

Khone, on the upper Mekong river (Massie).

A. laosianus Bavay, Journ. de Conchyl. xlvi, 1898, p. 15, pl. 2. f. 1, 1 *a*; with var. *albo-cærulescens*, p. 16, pl. 2, f. 2, 2 *a*.

The pink aperture and peristome give individuality to this species. There is a single black-brown varix on the last or penultimate whorl, and in this it differs from the species with which I have provisionally associated it.

Color-var. *albocærulescens* Bavay. Pl. 62, figs. 62, 63.

Bluish-white, with paler streaks representing the brown ones of the typically colored form. Aperture roseate, but paler. One or two black varix-bands on the last whorl. Occurred with typical *laosianus*.

II. Sinistral Division (Section *Syndromus*).

Shell always sinistral, usually thin, and never marked with varix-stripes; the parietal callus usually thin and transparent. The epiphallus and flagellum are much shorter than in typical *Amphidromus*.

Species of this division extend along the island-chain from Java east to the Tenimber Islands, in Celebes, Borneo and the adjacent extreme of Paragua, Sumatra, and on the continent northward to the Sylhet Hills and the southern border of China. The species are excessively variable, and some forms from continental Asia are singularly like species of Java and even Timor. The *xiengensis* and *porcellanus* groups are thus merely continental and insular forms of the same type.

The species are if possible more arbitrary than among the large forms of the genus. The following key to groups is quite artificial.

Groups of Southeastern Asia (mainland).

a. Shell longitudinally ribbed, thin, the peristome brown.
Group of A. begini, p. 188.

*a*¹. Not ribbed.

b. Peristome colored; shell yellow or with green lines.
Group of A. mouhoti, p. 185.

*b*¹. Peristome white; shell yellow or with two bands at base; columella with a shallow groove at its insertion.
Group of A. sylheticus, p. 188.

b^2. Peristome white, no noticeable groove at root of columella; spire with longitudinal flames bisected by a median light line, or without markings.

Group of A. xiengensis, p. 193.

Groups of the East Indian Islands.

a. A small nodule at the posterior angle of aperture, separated from the outer lip by a groove.

Group of A. contrarius, p. 210.

a^1. No such nodule developed.

b. Yellow, with two orange bands and usually 3 or 4 dark bands; no flames; umbilicate, solid.

Group of A. lævis, No. xvii.

b^1 Elongate, umbilicate, more or less streaked, not banded; colors dull. Northern Celebes.

Group of A. sinistralis, No. xix.

b^2. Flammulate, striped, or spotted in spiral series.

c. Lip roseate or black; no roseate umbilical tract; flames of spire when present bisected by a light spiral. Islands east of Java.

Group of A. latestrigatus, p. 205.

c^1. Lip white; spire with flames cut by a median light girdle; base generally with two dark zones. Java, S. Celebes and islands southward.

Group of A. porcellanus, p. 200.

c^2. Plain yellow or whitish, or with 2 spot-bands above and 2 continuous bands below. Allor and Pura Is.

Group of A. inconstans, p. 209.

c^3. Species of Java, Sumatra, Borneo and Paragua.

Group of A. adamsi, No. xviii.

8. *Group of A. mouhoti.*

Rather small sinistral species with green-lineate or yellow cuticle, the peristome pink, brown or purple. Siam to Annam.

a. Shell whitish or yellow, the last whorl or more covered with green lines.

b. peristome pink.

c. form narrow; upper whorls often maculate with brown. *mouhoti*, p. 186.

c^1 form broader; spirally striate, not maculate above.
roseolabiatus, p. 188.

b^1. peristome dark brown · diam. less than half the length.
smithii, p. 186.

a^1. Shell pale yellow with roseate apex; last whorl obtusely angular, with an orange sutural border; peristome purple.
cruentatus, p. 187.

A. MOUHOTI (Pfeiffer). Pl. 60, figs. 33, 34, 35.

Shell sinistral, subperforate, oblong-conic, thin, very delicately striatulate, little shining; *buff, closely painted with hair-like green streaks*. Spire long-conic, the apex rather acute, reddish. Whorls 7, scarcely convex, the upper ones sometimes *tessellate with brown;* last whorl three-sevenths the total length, subangulate in the middle, tapering basally and subcompressed. Columella little thickened, twisted, pale lilac. Aperture oblique, semi-oval, the base somewhat effuse; peristome thin, expanded, *lilac-rose colored*. Length 34, diam. 14, aperture 15 mill (*Pfr.*).

Siam (Mouhot); *Brelum, in the Stiengs country, Cochinchina* (Massin).

Bulimus mouhoti PFR., P. Z. S., 1861, p. 194; Novit. Conch., p. 170, pl. 46, f. 5, 6; Monogr. Hel. Viv., vi, p. 30.—MORELET, Series Conchyliologiques iv, p. 263.—*B. schomburgki var. mouhoti* MARTENS, Ostas. Landschn., p. 80.—*Amphidromus mouhoti* Pfr., FISCHER, Soc. d'Hist. Nat. d'Autun, iv Bull., 1891, p. 116.—FULTON, t. c., p. 88, pl. 7, f. 11 (1896).

The light green striæ of the last whorl vary from numerous to merely vestigial. The species is named in honor of M. Henri Mouhot, the intrepid Cambodian traveler, who lost his life by fever in exploring the Mekong valley.

A. SMITHII Fulton. Pl. 60, figs. 37, 38.

"Shell sinistral oblong-conic, imperforate, rather thin, white; suture impressed and slightly crenulated, last one and a half whorls covered with close-set oblique green lines, which are crossed by fine spiral lines of a darker color; a narrow, dark green band at the suture of the lower whorls fading to yellow above; whorls 7, slightly convex, third whorl with two spiral rows of light-brown spots; columella straight, scarcely expanded above; lip narrowly expanded and reflected; lip and columella dark brown" (*Fulton*).

Long. 35 millim., maj. diam. 16 millim (mature specimen).

Long. 39 millim., maj. diam. 17 millim (lip not expanded).

Annam (Eudel).

A. smithii Fulton, Ann. Mag. N. H. (6), xvii, p. 88, pl. 7, f. 12, 12*a* (Jan., 1896).

"This species is described from two specimens in my collection One is evidently full-grown, except that the lip is not expanded; this specimen has its green epidermis in fine condition. The other specimen is perfect in form, but rather worn, and only shows traces of the epidermis. It chiefly differs from Mouhoti in its dark brown lip and columella, its longer form, and in not being subangulate at the periphery. Named after Mr. Edgar A. Smith, of the British Museum" (*Fulton*).

Var. *ventrosulus* Möllendorff.

Fruhstorfer collected a magnificent Amphidromus at Phuc-son, Annam, which agrees very well with Fulton's description; but he does not mention that the apex, about 3 whorls, is brownish-red. The fourth whorl shows brown, partly zigzag, spots, at the suture, but no second row of them. The lip and columella are not dark brown, but red-brown or violet-brown. The contour is stouter, diam. 21½, alt. 40, to 25, 48 mm. (*Mlldff.*, Nachrbl. 1900, p. 132).

A. cruentatus (Morelet). Pl. 60, figs. 39, 40.

Shell sinistral, imperforate, oblong-conic, smooth, glossy. *Pale straw colored*, washed with pale green at the base, *the apical two whorls roseate*, the third dotted with reddish-brown. Whorls 6½ to 7, a little convex, the last swollen, *obtusely angular*, delicately costulate on the back, a little shorter than the spire; suture marked with an orange line. Columella vertical or slightly receding. Aperture oblong, angular below, white within; peristome well expanded, *deeply stained with carmine outwardly, purple inwardly*, the margins joined by a thin purple callus, columellar margin dilated. Length 33, diam. 15, aperture 16 mill. (*Morel.*). *Cambodia.*

Bulimus cruentatus Morelet, Séries Conchyliologiques, iv, p. 264, pl. 13, f. 5 (April, 1875).—Pfr., Monogr., viii, p. 24.—*A. cruentatus* Morel., Fischer, Soc. d. Hist. Nat. d'Autun, 4 Bull., p. 115.—Fulton, t. c., p. 89.

The purple peristome is a characteristic feature of this species.

A. ROSEOLABIATUS Fulton. Pl. 60, figs. 36.

"Shell sinistral, ovate-conic, moderately umbilicated, rather solid; whorls $6\frac{1}{2}$, slightly convex; obsoletely angulated at the periphery; white above, lower whorls pale lemon, with oblique *close-set light green lines; spirally striated;* lip and columella pink, expanded, lip somewhat reflected; interior of aperture white. Long. 36 mill., maj. diam. 21 mill" (*Fulton*). *Siam.*

A. roseolabiatus FULTON, Ann. Mag. N. H. (6), xvii, p. 89, pl. 6, f. 8 (January, 1896).

"This species is described from two specimens (young and adult); they were upon a tablet with the type of *Mouhoti*, from which they can be separated by the much broader form, the more distinct spiral striæ, and by the absence of markings on the upper whorls" (*Fulton*).

9. *Group of A. begini.*

A. BEGINI (L. Morlet). Pl. 59, figs. 28, 29.

Shell sinistral, almost covered rimate, fusiform, thin, shining; white, ornamented with irregular brown flames, and covered with irregular *longitudinal ribs*, some of them forked. Spire elevated, composed of 6–7 convex and rapidly increasing whorls, separated by a noticeably crenulate suture; the first three whorls smooth, with bright brown apex, the others ribbed; last whorl swollen, two-thirds the entire length of the shell. Aperture subangular below, white within, showing the flames by transparence; *peristome brown*, rounded, a little thickened and reflexed; columellar margin straight, bright brown, dilated and in large part covering the umbilical chink. Length 25, diam. 13, aperture 12 mill. (*Morl.*).

Cambodia: *Plateau of Stung-Trang* (*Pavie*).

Bulimus (*Amphidromus*) *begini* L. MORLET, Journ. de Conchyl., xxxiv, 1886, p. 74.—*Amphidromus begini* L. MORLET, Journ. de Conchyl., xxxvii, 1889, p. 128, 177, pl. 6, f. 4.—FULTON, t. c., p. 88.

The corrugated surface readily distinguishes this from all other species known.

10. *Group of A. sylheticus.*

Small, sinistral species, uniform pale yellow or with two bands on the base, the peristome white, *a shallow groove or gutter* at the junction of the columella with the body. Apex punctate. Khasi Hills to the Mergui Is. and eastward.

A. SYLHETICUS (Reeve). Pl. 63, figs. 97, 98.

Shell sinistral, umbilicate, ovate conic, polished, striatulate, the first whorl weakly punctulate; *greenish-yellow* below the periphery, paler above, fading on the spire, the early whorls and apex whitish. Whorls $5\frac{1}{2}$, slightly convex, the last but weakly convex above, very convex, full and sack-like below. Aperture ovate, oblique, slightly brown or ochre tinted within; the *peristome white, reflexed; columella with slightly convex inner edge,* broadly dilated, *guttered at its union with the body of the shell;* the dilated edge overhanging a rather large umbilicus, and a little thickened where it passes upon the parietal wall. Parietal callus thin and translucent.

Alt. 26, diam. 15, longest axis of aperture 14 mill.

Alt. 24, diam. 14, longest axis of aperture $12\frac{1}{2}$ mill.

Western India: *Southern slopes of the Khasi and Garo Hills* (Godwin-Austen); southward to Sylhet? (Reeve).

Bulimus sylleticus REEVE, Conch. Icon., pl. 77, f. 564 (Aug. 1849).—PFR., Monogr. iii, p. 322; viii, 42; Conchyl. Cab., p. 68, pl. 20, f. 25, 26.—HANLEY & THEOBALD, Conchologia Indica, pl. 19, f. 9.—GODWIN-AUSTEN Journ. Asiatic Soc. Bengal. xlv, 1876, pt. 2, p. 316.—*Amphidromus sylleticus* FULTON, Ann. Mag. N. H. (6), xvii, p. 79 (1896).—*Bulimus* (*Napaeus*) *sylleticus* MARTENS in Albers, Die Hel., p. 234.—*A. sinensis* var. *sylletica* Bens., NEVILL (in part), Handlist Moll. Ind. Mus., i, p. 127.

One of the most northwestern species in distribution. Godwin-Austen doubts its occurrence at Sylhet, but perhaps the district, not the town was intended, in which case the name is appropriate enough. Fulton considers *B. lepidus* Gld. a synonym.

The distinctly greenish yellow color of the lower portion, sack-like base (particularly noticable in a rear view), and the sort of gutter at the root of the columella, are characteristic features.

A. MASONI (Godwin-Austen). Pl. 62, fig. 72.

"Shell sinistral, acuminately oblong, thick, side of spire rather flat, whorls 7, smooth and shiny, under lens finely and spirally striate, color sea-green, intenser below the keel, paling towards the apex, the columella dark purple, a narrow fillet of same color borders the suture closely below, commencing at the upper and outer angle of the aperture. Aperture oval, angular above, lip slightly reflected. The last whorl slightly keeled" (*G.-A.*).

Alt. 1.2, diam. 0.5 inch (30, 12½ mill.).

Assam: *Dihiri Parbat, Dafla Hills*, 2000 ft. elev. (Godwin-Austen).

Bulimus masoni G.-A., Journ. Asiatic Soc. of Bengal, xlv, 1876, pt. 2, p. 316.—*A. masoni* Fulton, Ann. Mag. N. H. (6), xvii, p. 81, pl. 6, f. 2.—*Amphidromus daflaensis* Godwin-Austen, Nevill, Hand-list Moll. Ind. Mus. i, p. 127 (1878).

This handsome *Bulimus* is very similar in form to *B. sylheticus* Reeve, but this latter shell is smaller, exhibits no trace of spiral striation, has its surface more polished, while the columellar margin and outer lip is pure white; and in dozens I have collected no trace of a band is ever seen. In color too *B. sylheticus* differs from the new form in being lemon-yellow with a greenish tinge on the body whorl (*G.-A.*).

It is named in honor of Mr. J. Wood Mason.

A. lepidus (Gould). Pl. 63, fig. 99.

Shell small, usually sinistral, slightly perforate, ovate-conic, elevated, polished, citrine. Whorls 6, convex, the last ventricose; suture well impressed. Aperture subcircular; peristome white, reflexed, dilated at the columella, the ends approaching. Length of axis seven-eighths, diam. one-half inch (*Gld.*).

Mergui Islands (Rev. J. Benjamin).

Bulimus lepidus Gould, Proc. Bost. Soc. N. H., vi, p. 12 (Oct., 1856); Otia Conch. p. 219.—Pfr., Monogr. vi, p. 33.—Hanley & Theobald, Conchologia Indica, p. 34, pl. 80, f. 6.

"A pretty shell, grouping with *lævis*, *adamsii* and *moniliferus*, but smaller, proportionally shorter and more ventricose, and differing entirely in coloring, texture and the broadly rounded form of the aperture" (*Gld.*). The authors of the *Conchologia Indica* remark that "except in being shorter, with more rounded whorls, and without a notch at the commencement of the pillar-lip, it might be taken for *sylheticus*." Fulton considers it a synonym of *A. sylheticus;* but as that is a species of the hills and this inhabits a region rather different faunally, I allow it to stand pending further comparisons of a good series of the Mergui form with Reeve's species.

A. sinensis (Benson). Pl. 62, figs. 64, 65.

Shell sinistral, narrowly umbilicate, ovate-conic, solid, rather

smooth; *buff-whitish, with two reddish bands on the base.* Spire conic, the apex rather acute, suture deep, whorls 6, a little convex, the last a little shorter than the spire, the base rounded. Columella short, subvertical. Aperture oblique, oval; peristome somewhat thickened, *pale lilac* colored, the margins converging, outer margin expanded, *a brown streak back of it;* columellar margin reflexed, overhanging, *channelled* transversely at its upper termination. Length 31, diam. above the aperture 16 mill. (*Pfr.*)

"*Southern China*" (Benson); *Pegu* (Theobald, Stoliczka); *Khasi Hills* (Nevill).

Bulimus sinensis Bens., Ann. Mag. N. H. 1851, viii, p. 264.—Pfr, Monogr. iii, p. 320; iv, 382; vi, 27; viii, 42; Conchyl. Cab., p. 67, pl. 20, f. 1, 2 (description and figures from Benson's type).—*Amphidromus sinensis* Nevill, Hand-list Moll. Ind. Mus. i, p. 126, with var. *globosa* Nevill, *flava* Pfr., and *sylhetica* Rve.—Fulton, Ann. Mag. N. H. (6), xvii, 1896, p. 80, with var. *vicaria* and *gracilis.*

I have not seen this species, and the type is said to be lost from Benson's collection in the Cambridge museum. Perhaps it was not returned by Pfeiffer, and is now in Dohrn's collection.

It resembles *A. sylheticus* in the globose base and groove at root of the columella, but differs in being stouter in form, two-banded below, and with a brown streak behind the lip, which is said to be pale lilac colored. Nevill mentions but does not describe a var. *globosa* from Chittagong, probably identical with the following:

Var. *vicarius* Fulton. Pl. 62, figs. 67, 68, 69.

Differs from *A. sinensis* "in being not so broad in proportion to its length and in coloration. It is broader than *sylheticus*, and instead of being an uniform green color, it is yellow, with two (sometimes three) more or less distinct dark brown bands encircling the lower part of the last whorl. This variety varies a great deal in size and form. I give here dimensions of two specimens out of a series in the British Museum: length 33, diam. 17 mill.; length 21, diam. 14 mill." (*Fulton*).

"*Sheeoay Gheen*" or *Shwegyeen*, *Pegu* (figs. 67, 68); *Chittagong* (fig. 69).

B. sinensis Hanley & Theobald, Conch. Indica, p. 11, pl. 21, f. 5, 6.—*A. sinensis* var. *vicaria* Fulton, l. c.

The specimen from Chittagong before me is more slender than

A. sylheticus, not "baggy" below, and almost white with a faint ochre band above each of the purple-black ones. The apical whorls are corneous-white, and weakly punctate, and there is a perceptible groove at the root of the columella. The peristome is pure white, and there is no dark stripe behind the lip. Alt. 26, diam. 14½, longest axis of aperture 13 mill. (fig. 69).

Var. GRACILIS Fulton. Pl. 62, fig. 71.

"A very narrow, solid form; pale yellow with two purple-brown bands at lower part of last whorl; the third and fourth whorls encircled with *four rows of light brown spots;* lip and columella thickened and expanded." (*Fulton.*) *Pegu* (British Museum).

A. sinensis var. *gracilis* FULTON, t. c., pl. 6, f. 10 (1896).

This may belong nearer A. flavus. I have not seen specimens.

Var. INDISTINCTUS n. v. Pl. 62, fig. 70.

Pale yellow, with a subperipheral bluish band and a circumcolumellar dusky reddish one; bluish above the periphery with faint pale lines, and a buff band below the suture; the spire bluish, 1½ early whorls white, sparsely punctate, with a black apical spot. Whorls 6, the last rather baggy below. Peristome white, reflexed, the columella dilated and *recurved, its face convex;* noticeably grooved at the root; the umbilicus quite small. Alt. 30½, diam. 16½, longest axis of aperture 15 mill. *Laos Mts.*

A. ROEMERI (Pfeiffer). Pl. 63, figs. 95, 96.

Shell sinistral, perforate, ovate-conic, rather solid; lightly striate and somewhat decussated by very close spiral striæ visible under a lens; flesh-colored with a pale band at the suture. Spire conic, the apex rather acute. Whorls 6, a trifle convex, the last about as long as the spire, subangulate and with two reddish bands below the middle, the base rounded. Aperture oblique, auriform; peristome simple, the outer margin narrowly expanded, columellar margin subvertical, dilated, reflexed and overhanging above. Length 23½, diam. above aperture 13½, aperture 12 mill. long. (*Pfr.*).

Laos Mts. (Mouhot).

Bulimus roemeri PFR., P. Z. S., 1862, p. 274, pl. 36, f. 4; Mouhot's Travels in the central parts of Indo-China, ii, plate opp. p. 186, f. 4 (1864); Novit. Conch., p. 217, pl. 57, f. 10, 11; Monogr. vi, p. 44.—(?)MARTENS, Ostas. Landschn., p. 81 —*A. roemeri* Pfr., FULTON, t. c. p. 80.

On first view similar to *A. sinensis* Bens., but differs by its flatter whorls, spiral striation, non-thickened peristome, etc. (*Pfr.*)

A. HEMICYCLUS Rochebrune.

Testa obtuse perforata, elliptice pyramidata, semicircularis, solida, politissima, alba, fasciis latis violaceis spiraliter cincta; anfractibus 6; penultimo sub quadrato; ultimo spiram superante, intense curvato; apertura elliptica, inferne acuta; peristomate sub recto, labro reflexo, albo; columella reflexa, obliqua, curvata. Long. 30, lat. 10 mill. (*Rochebr.*, Bull. Soc. Philom., Paris, vi, 1881–2, p. 117.

Bangkok (Bocourt).

Dr. Jousseaume, who examined the type, thinks this species near *A. lævis* Müll., but distinct. The description does not seem very lucid, and is given without translation.

11. *Group of A. xiengensis.*

Farther-Indian representatives of the Java-Timor group of A. porcellanus. Rather slender and thin, the spire with flames bisected by a median light line, the base with two spiral bands; or with some modification of this fundamental pattern, or rarely without markings. Apex tipped with a blackish dot. Peristome usually white. Suture generally with a colored border or line below.

A number of identifications by various authors of Javan or Bornean species from Indo-China, were apparently based upon forms of the present group, though the literature, in the absence of descriptions, gives no certain clue. The chief references follow:

A. furcillatus Mouss., ROCHEBRUNE, Bull. Soc. Philomathique de Paris, vi, 1881–2, p. 71. Bords du Prek-Scholl, Cambodia (Dr. Harmand).

A. lævus Müll., ROCHEBR., l. c. Montagnes de Chaudoe [Chaudoc] (Dr. Harmand).

A. adamsi Reeve, ROCHEBR., t. c., p. 72. Prek-Scholl, au sud de Cratate (Dr. Harmand).

Bulimus adamsii Reeve, MABILLE & LEMESLE, Journ. de Conchyl., 1866, xiv, p. 129. Banone, near Battambang; Phnum-Kretch, Cambodia.

A. contrarius Müll., MORLET, Journ. de Conchyl, 1889, p. 127, Mountains of the Elephant Chain, Cambodia.

A. SEMITESSELLATUS (L. Morlet). Pl. 60, figs. 41, 42, 43, 44.

Shell sinistral, slightly rimate, rather solid, smoothish, striatulate. Pale buff, fading to white on the spire, the first $1\frac{1}{2}$ whorls uniform white minutely marked with brown at the apex, following *whorls of the spire with two spiral series of brown spots*, those of the upper series square or rhombic, the lower elongated; *the suture with a conspicuous black or purplish border below;* last whorl uniform buff without markings other than the sutural band, or with a wide purple-black band below the periphery and another encircling the columella. Aperture white, half-oval, the peristome reflexed, white; columella rounded, dilated above and partially appressed; parietal callus a transparent film.

Length 35, diam. 16, aperture with peristome $16\frac{1}{2}$ mill. (type, figs. 41, 42).

Length $29\frac{1}{2}$, diam. $15\frac{1}{2}$, longest axis of aperture 15 mill. (figs. 43, 44).

Cambodia: *Mountains along the Mekong river below Stung-Trang; forests and mountains of Kampot at Kompong-Son; Mountains of the Elephant chain.* Siam: *Srakeo* (Pavie).

Bulimus (*Amphidromus*) *semitessellatus* L. MORLET, Journ. de Conchyl., 1884, xxxii, p. 387, pl. 11, f. 2, 2*a*.—*A. semitessellatus* MORLET, J. de C., 1889, p. 128.—FISCHER, Soc. d'Hist. Nat. d'Autun, iv, 1891, p. 117.—FULTON, Ann. Mag. N. H. (6), xvii, p. 87.

Rather more solid than most members of its group, and with a special pattern of its own. The basal zones of the last whorl (figs. 43, 44) do not continue to the lip, or may be entirely absent, as in Morlet's type (figs. 41, 42).

A. XIENGENSIS L. Morlet. Pl. 63, figs. 75, 76.

Shell sinistral, narrowly perforate, elongate, conoid, subfusiform, glossy. Growth-striæ very fine on the upper whorls, gradually becoming more prominent on the last whorl, near the aperture. Spire conic, the apex bluish; whorls $6\frac{1}{2}$–7, the two earlier yellow, those following ornamented on a light yellow ground with long radial *brown and curved flames, cut in the middle by a narrow yellow spiral zone;* the suture bordered by a narrow yellowish zone *below which there is a series of little brown spots.* Last whorl having *a continuous reddish-brown sutural zone*, and on its upper part, a crowded series of brown

flames cut by a median yellow spiral, its lower or basal part having three concentric zones (a yellow one between two brown ones). Aperture suboval, somewhat angular below, whitish inside, the margins joined by a very thin and transparent callus; columella thick, rounded, white; lip widely reflexed, white. Length 38, diam. 17½–18, length of the aperture 14–16 mill (*Morlet*).

Laos: *Plateau of Xieng-Moi, and the forest on the banks of the Menam-Pinh* (Pavie); *Luang-prabang* (Counillon); *Prang* (W. L. Abbott).

Amphidromus xiengensis L. Morlet, Journ. de Conchyl., 1891, p. 27, 232, 240, pl. 5, f. 4.—Ancey, Ann. Mus. d'Hist. Nat. Marseille (Sér. 2), Bulletin, i, 1898, p. 134.—Dall, Nautilus, xi, p. 37. —*A. porcellanus* var. *xiengensis* Morlet, Fulton, Ann. Mag. N. H. (6), xvii, p. 79 (1896).

Very closely allied to the Javan *A. porcellanus*, but somewhat more solid and a little larger, with a subsutural series of dots on the upper whorls and a reddish line below the narrow pale sutural border on the last whorl. The dark apical dot is also larger. I am quite unable to agree with Fulton in his reference of this form and *multifasciatus* to *porcellanus* and *contrarius* respectively. Unless the whole *porcellanus* group be lumped, as some authors have treated the *perversus* group, the present species (as herein constituted to include color-varieties) has as good a right to stand as any of those recognized.

Ancey reports specimens less elongated than the figured type, but agreeing with it in coloration and other characters.

I suppose "*A. porcellanus* Mouss." of Rochebrune (Bull. Soc. Philomathique de Paris, vi, 1881–2, p. 71), from the forests of Owglu, Cochinchina, collected by M. Pierre, is really *xiengensis*.

Var. *multifasciatus* Fulton. Pl. 63, fig. 77.

"Like *maculatus*, but more solid; the umbilicus almost covered. Pale lemon color, with oblique brown stripes *interrupted by three or four narrow yellow bands;* a narrow *red band just below and encircling the suture*" (*Fulton*). *Cambodia* (British Museum).

A. contrarius var. *multifasciata* Fulton, Ann. Mag. N. H. (6), xvii, p. 78, pl. 7, f. 5 (January, 1896).

Var. *clausus* n. v. Pl. 63, figs. 79, 80, 81, 82.

Imperforate or nearly so, sinistral, thin but moderately solid, glossy, striatulate. Buff, with oblique or *longitudinal brown flames* not reach-

ing to the suture above, *obsolete on the latter half of the last whorl; cut into oblong spots by a light band revolving midway between sutures* and sometimes a number of other less complete bands; the *base encircled by a brown or purplish band below the periphery and a broad circum-columellar band*, brown toward the outer edge, fleshy within; *the space between the two bands and a very narrow umbilical patch yellow. A narrow red band revolves very near the suture*, but is replaced on the earlier whorls by a series of brownish spots; apex black. Whorls $6\frac{1}{2}$, slightly convex, the last somewhat tapering below. Aperture banded or white inside, the peristome reflexed, white; columella dilated and *appressed above*, closing or nearly closing the perforation; parietal callus very thin and transparent.

Length 32, diam. $15\frac{1}{2}$, longest axis of aperture $14\frac{1}{2}$ mill.

Length 31, diam. 16, longest axis of aperture 15 mill.

Laos Mts., Cambodia (coll. A. N. S. P.).

This form differs from *xiengensis* and *multifasciatus* in the obsolescence of the pattern on the last half whorl, and the less interrupted flames. The ground color might be called light fawn rather than buff, especially on the last half whorl of some of the specimens; the light basal band being yellow.

Var. TRYONI n. v. Pl. 63, fig. 78.

Similar to var. *clausus* in the narrow or closed perforation, form, black apex and buff or pale yellow ground-color. Spire pale; *third and fourth whorls with a subsutural row of brown dots*, and several narrow brown lines, continuous or interrupted; last two whorls with an orange line below the suture; the *base with two red-brown or blackish bands*, one subperipheral, the other around the columella, a yellow space between them. Columella spreading and *rounded* above, not in the least grooved at its root.

Length 32, diam. $15\frac{1}{2}$, longest axis of aperture $14\frac{1}{2}$ mill.

Length 33, diam. 16, longest axis of aperture $16\frac{1}{2}$ mill.

Laos Mts., Cambodia (coll. A. N. S.).

Somewhat like the smaller *A. fultoni* in color, but in my opinion allied to the preceding forms, from which it is differentiated chiefly by the total loss of flammules on the last two whorls. The subsutural line has become yellow, as in *A. porcellanus*, but it is not crowded to the suture as in that species, but separated therefrom by a pale line, as in *xiengensis*. In some specimens the lower band is bisected or divided into two bands. Compare *A. flavus* var. *proximus* Fulton,

which probably belongs to *xiengensis* rather than to *flavus*, if indeed the whole series does not intergrade.

A. FULTONI Ancey. Pl. 63, figs. 83, 84.

Shell sinistral, short, ovate-conic, minutely perforate, thin, obliquely striate, subangulate at the periphery, chiefly at the beginning of the last whorl. Spire rather shortly conic, apex with a quite small dark brown dot, the first $1\frac{1}{2}$ whorls minutely and sparsely punctulate. Whorls 6, the first ones distinctly, the later barely convex, last whorl rather ventricose ; $3\frac{1}{2}$ earlier whorls white, lower of a pale lemon color ; the third whorl ornamented with two series of pale brownish and very small spots ; the last whorl with a narrow yellow zone below the suture, circumscribed by an indistinct broad white band, and furnished with two fine brown revolving lines more or less evanescent towards the aperture, the upper one just below the periphery, the other around the yellow umbilical area ; the immediate vicinity of the umbilicus flesh-tinted. Aperture strongly oblique ; columella straight, thin, triangularly expanded, white. Lip thin, white, narrowly expanded.

Length $23\frac{1}{2}$, diam. 14, length of aperture 11 mill.

Length 22, diam. 13, length of aperture 11 mill.

Cochinchina.

Amphidromus fultoni Anc., Nautilus xi, p. 62 (Oct. 1, 1897).

"This, as well as the following [*A. eudeli*] are members of the group of *A. flavus* Pfeiffer, according to Mr. Hugh Fulton, who kindly examined the specimens and declared them to be new species. From the former it differs in being shorter, in having 6 whorls only, a dark-colored apex, two narrow revolving bands on the last whorl and other particulars. Named in honor of Mr. Fulton, who has very thoroughly and carefully monographed this difficult genus." (*Ancey*).

The pale biserial dotting of the third whorl, yellow line below the suture of the last, black dot at the apex and two basal bands, show this form to be near var. *tryoni* of *A. xiengensis* ; but that shell is more solid, more elongate, with less oblique, longer aperture, etc. Figured from the type specimen kindly lent by Mr. Ancey.

A. FLAVUS (Pfeiffer). Pl. 63, figs. 92, 93.

Shell sinistral, scarcely perforate, ovate-conic, thin, nearly smooth,

somewhat glossy; *uniform sulphur yellow.* Spire conic, the vertex white, rather acute. Whorls $6\frac{1}{2}$, a little convex, the last nearly three-sevenths the length of the shell, *the base swollen.* Columella scarcely inflated, subvertical. Aperture oblique, inverted auriform; peristome thin, expanded and a little reflexed. Length 25, diam. above aperture 12, aperture $11\frac{1}{2}$ mill. (*Pfr.*).

Siam (Mouhot); Laos: *Luang-prabang* (H. Counillon); Cochinchina: *Thu-Dan-Moth* (Eyriés), and the arroyo of *Long-ho*, near Ving-Long (Le Mesle).

Bulimus flavus Pfr., P. Z. S., 1861, p. 194; Novit. Conch., p. 171, pl. 46, f. 7, 8; Monogr. vi, p. 32.—Morelet, Séries Conchyl. iv, p. 265 (1875).—*Amphidromus flavus* Pfr., Fulton, Ann. Mag. N. H. (6), xvii, 1896, p. 81.—Ancey, Annales Mus. d'Hist. Nat. Marseille (2), Bull. I, p. 134 (1898).

I have not seen this species, which seems near the banded and maculate *multifasciatus* and *xiengensis.* Fulton remarks that it is more solid than *adamsi* var. *inornatus*, with a *faint reddish band at lower part of last whorl.* The locality "Siam" is doubtful, or possibly correct for the eastern edge of that country.

Var. proximus Fulton. Pl. 63, fig. 94.

"Differs from *flavus* in being more elongate, has *two* indistinct bands at basal part of last whorl, and has a spiral line of equidistant light brown spots just below suture of third and fourth whorls. A single specimen in my own collection, locality unknown" (*Fulton*).

This variety may perhaps be referable to *A. xiengensis* rather than *flavus*, and near my var. *tryoni.*

A. areolatus (Pfeiffer). Pl. 63, figs. 85, 86.

Shell sinistral, subperforate, ovate-conic, thin, striatulate somewhat glossy; buff-whitish, painted with *brown flames which generally fork above.* Spire conic, the apex minute, brown; suture submarginate. Whorls $6\frac{1}{2}$, moderately convex, the last a little shorter than the spire, rounded beneath, having *a roseate patch at the columella, surrounded by a brown and a buff band.* Columella somewhat swollen, slightly twisted. Aperture oblique, inverted auriform; peristome thin, rather broadly expanded, the columellar margin narrowly reflexed. Length 23, diam. above aperture 11, length of aperture $10\frac{1}{2}$ mill. (*Pfr.*). *Siam* (Mouhot).

Bulimus areolatus Pfr., P. Z. S., 1861, p. 194; Novit. Conch.,

p. 172, pl. 46, f. 11, 12; Monogr. vi, p. 33.—*Amphidromus areolatus* Pfr., Fulton, Ann. Mag. N. H. (6), xvii, p. 81.

"A thin shell somewhat like *porcellanus*, but with close forked markings on the upper whorls" (*Fulton*).

A. zebrinus (Pfeiffer). Pl. 63, figs. 90, 91.

Shell sinistral, subperforate, oblong-conic, rather solid, lightly striate; white, *closely painted with rather wide, nearly straight or somewhat waved black-brown stripes.* Spire slender, conic, the vertex a little acute, and black; suture shallow, white. Whorls $6\frac{1}{2}$ the upper convex, the rest slightly so, last whorl two-fifths the total length, a trifle tapering below. Columella subinflated, rather straightly receding. Aperture oblique, semi-oval; peristome simple, rather broadly expanded, the columellar margin reflexed, overhanging. Length 25, diam. above aperture $10\frac{1}{2}$, length of aperture 11 mill. (*Pfr*), *Siam* (Mouhot).

Bulimus zebrinus Pfr., P. Z. S., 1861, p. 194; Novit. Conch., p. 172, pl. 46, f. 9, 10; Monogr. vi, p. 32.—*Amphidromus zebrinus* Pfr., Fulton, Ann. Mag. N. H. (6), xvii, 1896, p. 81.

Var. eudeli Ancey. Pl. 63, figs. 87, 88.

Shell sinistral, rather solid, oblong-conic, obliquely striate, narrowly rimate; spire conic, apex dark brown; whorls 7, convex, the first ones dull white, the fourth and lower ones cream, with oblique bluish-gray stripes, becoming reddish-brown on the spire, interrupted at the middle on the penultimate and preceding whorls by a submedian light spiral line, and evanescent at the suture; last half-whorl bluish-gray, with a cream-yellow band around the middle of the base, and an umbilical area of the same tinge; a narrow infra-sutural line of a reddish-brown color on the last and penultimate whorls. Aperture small, oblique, expanded, interior greyish. Columella thick, reflected, paler at the upper part. Lip thickened, dark-brown externally, purple inside, particularly so near the umbilicus.

Length 28, diam. 14, length of aperture 11 mill. (*Ancey*).

Length 26, diam. $12\frac{1}{2}$, length of aperture 12 mill. (specimen).

Annam: *near Binh-Dinh*, in forests (E. Eudel).

A. eudeli Anc., Nautilus xi, p. 63 (Oct. 1, 1897).—*A. zebrinus* subsp. *fuscolabris* Mlldff., Nachrbl., 1898, p. 75.

This is allied to *A. zebrinus* Pfr., but is apparently larger and

more solid, and differs in having a purple peristome, externally black-brown, wider stripes, and a reddish subsutural line. Figured from one of the types, kindly sent by Mr. C. F. Ancey.

Dr. von Möllendorff describes an *A. zebrinus* subsp. *fuscolabris* as somewhat larger than typical *zebrinus*, length 27, diam. 13 mill., the lip less expanded, dark brown; otherwise the same. It is from the Boloven Plateau, western Annam, on the left bank of the Mekong River (C. Roebelen). This form is apparently identical with *A. eudeli* Ancey.

12. *Group of A. porcellanus.*

Spire decorated with flames or stripes bisected by a submedian light line. Distribution, Java, Southern Celebes and islands to the southward of Celebes, above the Timor-Java chain.

The separation of this from the preceeding group is merely one of convenience.

A. POECILOCHROA 'Bttg.' Fulton. Pl. 64, figs. 1, 2, 3.

Shell nearly or quite imperforate, sinistral, thin, ovate-conic, *polished* and glossy, faintly striatulate. Pale lemon-yellow, fading to whitish on the spire, *marked above the periphery with wide purple-brown stripes* not reaching to the suture, and *bisected by a yellow spiral band* running about midway between sutures, on the last half-whorl changing to reddish, and accompanied by a narrow dark band; many of the stripes on the spire forked above; *base with two wide purple-brown spiral bands and an umbilical patch, separated by two paler bands, the upper one narrow* and yellow, the lower wider and reddish. Whorls $6\frac{1}{2}$, the earlier $1\frac{1}{2}$ uniform fleshy. brown; suture moderately impressed, *narrowly edged with black-brown below, this bordered again by a whitish margin.* Aperture showing the color pattern within; peristome narrowly expanded, flesh-tinted. Columella vertical, its edge rather narrowly reflexed.

Alt. 35, diam. 19 mill. (type).

Alt. 34, diam. 18, longest axis of aperture 17 mill.

Sumbawa Island.

A. poecilochroa (Boettger MSS.) FULTON, Ann. Mag. N. H. (6), xvii, p. 77, pl. 6, f. 7 (Jan., 1896).—*Bul. contrarius* MOUSSON, Moll. Java, p. 115.

Evidently allied to *A. porcellanus*, differing in the more ventricose shape and consequently longer aperture, narrower columella, and

some details of color pattern. It has not the thickened parietal callus of *A. contrarius*, but is evidently the form Mousson reported as an immature *contrarius* from Dompo, near Bima, Sumbawa (not *Celebes* as Mousson says), having "Ausgezeichnet starker in quadratischen Flecken bestehender Zeichnung."

A. PORCELLANUS (Mousson). Pl. 64, figs. 5, 6, 7.

Shell sinistral, perforate or sometimes closed, long-conic, thin, glossy, striatulate. *White or buff, with two broad brown zones on the base and flames or stripes of the same color above and on the spire, cut in the middle by a narrow white spiral band*, usually obsolete above this band on the last whorl; suture narrowly yellow-bordered, a small black-brown dot at the apex. Whorls 6½–7, convex. Aperture small, banded within; peristome narrowly reflexed, white; columella dilated above; parietal callus scarcely visible.

Alt. 33, diam. 14½. longest axis of aperture 14½ mill.

Alt. 30, diam. 14½, longest axis of aperture 13½ mill.

Alt. 27, diam. 13½, longest axis of aperture 12 mill.

Western Java: *Warong Kapangdangan?* (v. Hasselt); *Buitenzorg* (Weber, Strubell). Sumatra: *Deli*, on the north coast (Leop. Martin).

Bulimus zebra VAN HASSELT, Algemeene Konst en letterbode, 1823, p. 233 (no description), and an unpublished plate 13, f. 1, copied in Schlegel's Handleiding, atlas, Weekdieren, pl. 1, f. 10. Not *B. zebra* Brug.—*Bulimus porcellanus* MOUSSON, Die Land- und Süsswasser-Mollusken von Java, p. 33, 110, pl. 3, f. 4 (1849).—PFR., Monogr. iii, p. 328; iv, 384; vi, 32; Conchyl. Cab., p. 138, pl. 41, f. 14, 15 (?).—MARTENS, Ostas. Landschn., p. 365.—*Amphidromus porcellanus* (Mouss.), MARTENS in Weber's Zool. Ergebnisse, ii, p. 241.—WIEGMANN, in the same work, vol. iii, p. 204, pl. 15, f. 2–11 (anatomy).—BOETTGER, Bericht Senck. Naturforsch. Ges., 1890, p. 146.

This species differs from *A. contrarius* in its thin parietal film, without a denticle above. In color-pattern it is much like the larger and more ventricose *A. poecilochroa*, though the lower band is wider and extends to the root of the columella. The chief variation is in the flames or stripes of the last whorl, which may be narrow and extend upward nearly to the suture, or short, even completely wanting. This is sufficiently shown in the figures. The length of the shell varies more than the diameter.

A. FILOZONATUS ('Mousson' Martens). Pl. 64, fig. 4.

Shell sinistral, long-conic, rather solid, lightly striatulate, glossy; the last whorl grayish-brown with *narrow whitish bands* and a [peripheral] black-spotted band; the whorls above buff-whitish with squarish blackish blotches cut by a band, the upper whorls white with black apex. Aperture oblong-ovate, angular below, brown inside, about two-fifths the length of the shell; peristome rather thickened, white, narrowly reflexed; scarcely any parietal callus; columellar margin nearly straight, dilated (*Martens*).

Alt. 35, diam. 17, aperture 15 mill.

Java: *near Grisse*, not far from Surabaya, in eastern Java (Martens), and on the neighboring island *Madura* (Zollinger).

Bulimus lævis var. DESH. in Fér. Hist., pl. 161, f. 9.—PFR., Conchyl. Cab., pl. 41, f. 5, 6.—*B. filozonatus* Mousson in coll., MARTENS, Ostas. Landschn., p. 358, pl. 21, f. 4.—*A. filozonatus* FULTON, Ann. Mag. N. H. (6), xvii, 78.

Von Martens mentions two varieties: the typical, with distinct blackish blotches and black-spotted band, and a paler form, orange-Isabelline, with the band and blotches obsolete. The whorls are less convex than in *contrarius*, and there is no nodule or thickening on the parietal wall. The coloring of one or several narrow whitish bands on the last whorl and maculate spire is characteristic, the peripheral tessellated band being sometimes obsolete.

A. MACULATUS (Fulton). Pl. 64, figs. 9, 10, 11.

"A shorter shell than *contrarius*, somewhat thinner, and the whorls less convex. In *maculata* the interrupted markings are smaller and more distant from each other, and fade away on the last whorl, *the last half volution being quite plain* except for two basal bands. Below and encircling the suture of the upper whorls there is a *spiral band of equidistant small brown spots* (Fulton).

Celebes: *Macassar* (type locality, Fulton); *Macassar and Bantimurong* (Sarasins); *Bua-Kraeng* (Fruhstorfer).

A. contrarius var. maculata FULTON, Ann. Mag. N. H. (6), xvii, p. 78, pl. 7, f. 4 (Jan., 1896).—P. & F. SARASIN, Land-Mollusken von Celebes, p. 211, pl. 26, f. 259, 260 (shell); pl. 31, f. 302 (radula).—MOELLENDORFF, Nachrbl. d. Malak. Ges., 1896, p. 146.—*A. contrarius* Müll. var., SMITH, Proc. Malac. Soc. Lond. ii, p. 102.—*A. maculatus* FULTON, Ann. Mag. N. H. (6), xviii, p. 102, 103, under *A. kalaoensis* (1896).

Described as a variety of *A. contrarius*, but as von Moellendorff has pertinently pointed out, it differs from that species in the important character of having a weak, thin-edged parietal callus, and no nodule near the posterior angle of the aperture, nor raised ledge below. I do not think it especially related to *contrarius*.

A. JUCUNDUS (Fulton). Pl. 64, fig. 8.

"Smaller than typical *filozonatus*, rather more solid; last whorl grayish-brown, with a yellow band around lower part; upper whorls white, with dark brown stripes interrupted by a narrow pale yellow band. Alt. 28, diam. 14 mill." (*Fulton*).

Celebes: *Macassar* (Fulton); *Bua Kraeng* (Fruhstorfer).

A. filozonatus var. jucunda FULTON, Ann. Mag. N. H. (6), xvii, p. 78, pl. 7, f. 8 (Jan., 1896).—*A. jucundus* Fulton, MOELLENDORFF, Nachrbl. d. Malak. Ges. 1896, p. 146.—*A. filozonatus* SMITH, Proc. Malac. Soc. ii, 102.

I agree with von Moellendorff that there is little ground for uniting this with the Javan *A. filozonatus*. It may prove a variety of *maculatus*.

A. ANNÆ Martens. Pl. 64, figs. 13–16.

Shell sinistral, elongate-conic, rather thin. Very lightly striatulate, rather glossy. Pale yellow with *diluted-brown streaks, interrupted by one or several zones of the ground color above, continuous on the last whorl*, the apex violet black, following $1\frac{1}{2}$ whorls uniform reddish. Whorls $7\frac{1}{2}$, rather flat, the suture narrowly appressed. Aperture three-sevenths the length of the shell, the parietal wall covered with a rather broad *reddish callus*, palatal interior pale, showing the bands through; peristome slightly thickened and expanded, whitish; base slightly rose-tinted, columellar margin rather wide, white, distinctly differentiated from the parietal callus (*Martens*).

Length 44, diam. 17, aperture 15 mill.

Saleyer Islands (Weber).

A. annae v. MART., in Max Weber's Zool. Ergebnisse einer Reise in Niederländisch Ost-Indien, ii, p. 240, pl. 14, f. 19–22 (1891).—FULTON, t. c., p. 87.—SMITH, Ann. Mag. N. H. (6), xviii, p. 149, pl. 10, f. 11 (1896).

"Variable in color; plain yellow with flesh-colored apex and rose columellar callus, or obliquely striped with black, the stripes being

more or less interrupted. Some specimens are stronger and heavier than the type" (*Smith*). Named for Anna Weber, who accompanied her husband in his East Indian explorations.

A. OSCITANS v. Martens. Pl. 67, figs. 1, 2, 3.

Shell sinistral, ovate-conoid, rather thin; yellow, painted with *rather wide brown stripes, which are continuous, nearly straight or a little bent*, and below the suture rarely forked. *Apex minute, reddish-brown.* Whorls 7, the upper ones nearly flat, the suture appressed and whitish, last whorl rather convex beneath. Aperture about half the shell's length or a little more, acutely ovate; peristome rather thin, the columellar margin vertical, appressed, the outer lip a little expanded, white; throat pale yellow showing the brown stripes through (*Martens*).

Length 40, diam. 19½, aperture incl. peristome 22 mill.

Length 40, diam. 18, aperture incl. peristome 20 mill.

Allor Island (Rolle, Everett); *Pura or Poera I.* (Everett).

A. inconstans var. *D*, FULTON, Proc. Malac. Soc. Lond. iii, p. 10, 213.—*A. oscitans* MARTENS, Archiv für Naturgeschichte, lxv, p. 29, pl. 3, f. 3, 4 (April, 1899).

"Most nearly allied to *A. sumbaensis* Fulton, from Sumba, but easy to distinguish by the white, not red, color of the peristome. The streaks are never interrupted by light spiral bands, as the rule is in *A. contrarius*, but only below the suture in places are dislocated; mostly simple, seldom forked above" (*Mart.*).

A specimen before me, from Allor Island (pl. 64, fig. 17) has 6 whorls, the last whitish above, retaining a thin greenish-yellow cuticle below; decorated with many purplish stripes, which on all but the last whorl *are cut by a narrow white spiral band*, as in *A. contrarius*. The stripes are dislocated above on the fourth whorl, forming a spot-band below the suture. Length 34, diam. 16, longest axis of aperture 18½ mm.

A. KALAOENSIS Fulton. Pl. 67, figs, 4, 11.

Shell sinistral, narrowly perforate, long conic, thin but moderately solid, glossy and lightly striatulate. Pale yellow, lighter on the spire, with *two belts of squarish or oblong dark brown spots* and sometimes a dark suprasutural line on the spire, *five on the last whorl*, that around the umbilicus and the next one nearly or quite continuous

bands. Whorls about $6\frac{1}{2}$, rather convex, the earlier $1\frac{1}{2}$ white with a black-brown apical spot; suture with a faint white line. Aperture ovate, white and showing the spots within; lip expanded, white; columella dilated above, white or lilac tinted; *parietal callus light red*, thin and translucent.

Alt. 32, diam. 16 mill. (type).

Alt. 34, diam. 16, longest axis of aperture $15\frac{1}{2}$ mill.

Kalao Island (A. Everett).

A. kalaoensis Fulton, Ann. Mag. N. H. (6), xviii, p. 102 (July, 1896).—Smith, same vol., p. 148, pl. 10, f. 10.

This species is intermediate between *A. annæ* and *A. inconstans*, having the pink parietal wall of the former, and the spot-bands of some forms of the latter species. *A. maculatus*, *annæ* and *kalaoensis* are doubtless closely allied and derived from a common ancestor. Fig. 4 is Fulton's type, fig. 11 a more elongate specimen differing a little in markings.

13. *Group of A. latestrigatus.*

Shell solid for this group, with well-expanded, reflexed or recurved lip, which is rose-colored or black. Coloring various, but spots of the spire, when present, are cut by a median pale band, and there is a tendency to split the continuous stripes of the last whorl or two into narrow spots forming interrupted bands. There is no pinkish or rosy umbilical tract.

a. Lip black; Flores Island. *A. floresianus*, p. 205.

a^1. Lip pink or purple-rose.

b. Lip reflexed and *recurved*; Timor; *reflexilabris*, p. 206.

b^1. Lip moderately expanded or slightly reflexed.

c. Broadly striped; form rather stout; Sumba I., *latestrigatus*, p. 207.

c^1. Striped; form more slender; Sumba I., *sumbaensis*, p. 208.

c^2. No stripes, but a narrow basal band; Sumba and S. Flores, *consobrinus*, p. 208.

A. floresianus Fulton. Pl. 65, figs. 17, 18, 19, 20.

Shell narrowly perforate, sinistral, oblong-conic, *solid* and opaque, smooth but rather lustreless, weakly striatulate. Color and pattern exceedingly variable; the first $1\frac{1}{2}$ whorls are uniform pink with a

black-brown apical dot; the next whorl is paler with a series of brown stripes or spots bisected by a median light girdle; the ground-color then changes to whitish, and then pale straw-yellow, which becomes more intense toward the base, and may be either uniform or with "one to ten brown spiral lines, which are sometimes continuous, sometimes interrupted." In some specimens the brown flames of the early whorls continue to the last, where they spread over the whole surface (figs. 19, 20). Whorls about 6½, a little convex. Aperture white or tinted within, becoming brown or lilac near the *reflexed, intensely black-brown peristome.* Columella dilated, black-brown outwardly, lilac within, continuous with the parietal callus, which is brownish toward the edge, translucent lilac or nearly colorless within.

Alt. 44, diam. 20 mill. (type).

Alt. 42, diam. 20½, longest axis of aperture 20½ mill.

Southern Flores (Everett).

A. floresianus Fulton, Ann. Mag. N. H. (6), xx, 211, pl. 6, f. 2 (August, 1897).

Although extremely variable in color, the black lip is constant in the specimens collected. To the type figure (fig. 17), I add others representing varying phases of coloration, figs. 19, 20 representing a pattern of which only very few specimens occurred.

A. reflexilabris Schepman. Pl. 65, fig. 21.

"Shell sinistral, elongately conical, slightly striated, imperforate, varying much in color, yellow with green streaks, pale or orange yellow, with the upper whorls yellowish or brown, apex yellow or black brown, upper whorls nearly always with brown flames or blotches, lower whorls commonly with a white zone beneath the sutures; whorls 6, slightly convex; aperture elongately-ovate, angular above, angularly rounded and slightly effused beneath, occupying with the peristome about half the length of the shell, interior white; lip strongly reflected, so as to reach and even partly to cover the back side of the shell and forming a canal having the appearance of a very thick peristome; columella thickened, like the lip of a pale rose-color, margins connected by a thin callosity" (*Schepm.*).

Alt. 39½, diam. maj. 18½, ap. alt. incl. perist. 29½ mill.

Alt. 42, diam. maj. 21, ap. alt. incl. perist. 21 mill.

Alt. 50, diam. maj. 23½, ap. alt. incl. perist. 27 mill.

Timor: *Amarassi* (Dr. Ten Kate).

A. reflexilabris Schepm., Notes Leyden Mus. xiv, p. 152 (1892). —Fulton, Ann. Mag. N. H. (6), xviii, p. 89, pl. 7, f. 2 (1896).

"This species varies very much in size and color, no two specimens being alike; the largest (somewhat bleached) one is totally yellow except the peristome, the smallest is yellowish orange, with white sutural zone, a dark apex and a few faint brown blotches ranged in two rows on the upper whorls; a third full-grown specimen and a juvenile one are yellow with more or less green, disposed in streaks on the last whorl, and have a white sutural zone; the full-grown specimen has a yellowish apex and two rows of brown blotches on the next whorls, which cease abruptly on the penultimate whorl; the younger specimen has a dark apex and dark flames, of which only a few are divided by a narrow white spiral zone; the penultimate whorl is partly brown-shaded. This species shows affinities to many other species of the East Indian Archipelago, the upper whorls of some specimens recall in mind *A. contrarius* Müll., the green whorl resembles some varieties of *A. furcillatus*. They differ from every known species by the uncommon development of the peristome, which is most characteristic and suffices to recognize the species at first sight" (*Schepm.*).

A. latestrigatus Schepman. Pl. 67, fig. 10.

"Shell sinistral, ovately-conical, nearly smooth, perforated, apical whorl blackish-brown, next whorl rose-color, the following whorls are white, then pale yellow, last whorl darker yellow, total number of whorls about $6\frac{1}{2}$; they are slightly convex, the four last with broad brown flames, which on the last whorl become greenish gray and are often confluent towards the base, sutures with a narrow white margin, accompanied by a blackish one (wanting in one specimen); aperture ovately oblong, angular above, rounded beneath, occupying less than half the length of the shell, bluish white interiorly; lip moderately expanded; columella nearly straight; like the lip dark rose-colored, margins connected by a thin callosity of the same color. Alt. $36\frac{1}{2}$, diam. maj. 21, apert. alt. incl. perist. $18\frac{1}{2}$ mill. Alt. 37, diam. maj. 19, apert. alt. incl. perist. 17 mill." (*Schepm.*).

Sumba (Soemba) Island: *Massoe*, in the central southeast, and *near Waingapoe* on the north coast (Dr. H. Ten Kate).

A. latestrigatus Schepman, Notes from the Leyden Museum, xiv,

p. 151 (1892).—*A. latistrigatus* Schepmann, Fulton, Ann. Mag. N. H. (6), xvii, p. 89, pl. 7, f. 1 (1896).

"This species differs from all the allied ones, by the broad flames, and the fine rose-color of the aperture; this last peculiarity is also found in *A. suspectus* Martens, *A. annæ* Martens and in the next species, but they differ in so many other respects that they may be easily recognized.

"The measurements taken from specimens from Massoe, show that they vary in form. In nearly all the specimens the flames of the upper whorls are traversed by a narrow zone of the ground color; the yellow color of the last whorl is more or less bright.

"A juvenile specimen from Massoe has the space near the umbilicus rose-color, with two brown spiral bands beneath the periphery. This and two adult specimens from the same locality, are in the finest condition, the other are more or less bleached" (*Schepm.*).

A. sumbaensis Fulton. Pl. 67, figs. 5, 6, 7, 8.

Shell sinistral, perforate or umbilicate, rather solid, opaque, smoothish. *Whitish, becoming cream or pale yellow on the base and pink on the upper whorls,* 1½ *earliest uniform reddish-purple* with a black tip, the subsequent whorls *striped with reddish-brown changing on the last whorl or two to bluish-gray*, these stripes rarely bifurcate above, often showing traces of spiral color-lines, not reaching quite to the white-edged suture, and on the early whorls generally cut by an indistinct median pale spiral. Whorls 6–6½, rather convex. Aperture ovate white with bluish stripes within, the *lip rather narrowly expanded, purple-rose colored;* columella purple, dilated above; parietal callus thin, rose tinted.

Length 34, diam. 16 mill. (type).

Length 34½, diam. 17, longest axis of aperture 17 mill.

Length 26½, diam. 13½, longest axis of aperture 13½ mill.

Sumba Island (Fulton).

A. sumbaensis Fulton, Ann. Mag. N. H. (6), xviii, p. 102 (July, 1896); xx, p. 214, pl. 6, f. 1 (1897).

Allied to *A. latestrigatus* Schepman, but narrower, with darker apical whorls, and less solid.

A. consobrinus Fulton. Pl. 67, fig. 9.

"Shell sinistral, oblong-conic, slightly perforate; whorls 6, con-

vex, yellow below fading to dirty white above, first three whorls of a semi-transparent flesh color, tipped at the apex with dark brown, last whorl obsoletely keeled at the periphery ; there is a narrow greenish-blue band just above the umbilical area, which is continued spirally upon the parietal wall ; lip and columella pale purple, connected by a thin reddish-brown callus ; lip slightly expanded and reflected ; interior of aperture white. Long. 32 mill., maj. diam. 15 mill." (*Fulton*). *South Flores Island* (Everett); *Sumba Island.*

A. consobrinus FULTON, Ann. Mag. N. H. (6), xx, p. 211, pl. 6, f. 3 (August, 1897).

Probably a variety of A. sumbaensis, but as I have not seen specimens I follow Fulton's estimate of its rank.

"Some specimens have an additional narrow spiral band just below the periphery. This species is very closely allied to my *A. sumbaensis*, but can easily be distinguished by its different coloration. Type in British Museum" (*Fulton*).

14. *Group of A. inconstans.*

A. INCONSTANS Fulton. Pl. 67, figs. 12–17.

Shell sinistral, perforate, oblong-conic, glossy, striatulate. Ground color yellow, fading to white on the spire, *the early whorls and apex uniform white;* typically the last whorl has *four spiral bands, the upper two composed of squarish blackish-chestnut spots alternating with pale intervals*, and ascending the spire ; *the lower two bands continuous* or irregularly interrupted. Or in some shells (*a*) all bands are absent, the shell yellow, or (*b*) with a single band below the periphery, or (*c*) with two basal bands. Spire slender, the summit very obtuse. Whorls about 6, slightly convex. Aperture oblique, *effuse at the base*, white or banded within. Columella straight, *rounded*, convexly reflexed and rolled back above, tapering and *very slender at its base*, usually with a more or less pronounced angle at its junction with the basal lip. Parietal callus a mere translucent film.

Length 38, diam. 19, aperture 19 mill. (type).

Length 35, diam. 17, aperture 16½ mill.

Length 30½, diam. 15½, aperture 15½ mill.

Length 29, diam. 16, aperture 16 mill.

Allor (*Ombai*) *Island*, north of Timor ; *Pantar I.*, west of Allor ; *Pura* (*Poera*) *Island* (Everett).

A. inconstans FULTON, Proc. Malac. Soc. Lond., iii, p. 10, fig. in

text (April, 1898); p. 213 (Mar., 1899).—*A. inconstans* var. *gracilis* MARTENS, Conchologische Miscellen, in Archiv f. Naturg. lxv, p. 29, pl. 3, f. 2 (April, 1899).

This species is near *A. kalaoensis*, but the aperture is somewhat longer and more effuse below, the earlier whorls and apex are invariably white, with no dark apical dot, and the parietal callus and umbilical area show none of the pink color of *kalaoensis*. The figures, drawn from specimens of the original lot, sufficiently show its variability in markings. The uniform yellow form with white top (*a*) occurred upon Allor, Pantar and Pura Islands, the other stripe-varieties upon Allor, and form *b* on Pura also.

Professor von Martens has distinguished the shells with only a peripheral band or none, and rather slim contour (forms *a* and *b* of Fulton) as var. *gracilis* (pl. 67, fig. 16); but there seems a minimum of use in such distinction, as it is quite impossible to draw a line between *b* and *c*, and the latter is equally near the typical form. If used at all, the varietal name *gracilis* should apply to figs. 14–17, while figs. 12, 13 represent the typical *inconstans*.

The striped form, "var. D" of Fulton, while probably of common ancestry with *inconstans*, may not be actually connected therewith, and will probably stand. See *A. oscitans*.

15. *Group of A. contrarius.*

Slender, sinistral forms, in which the *parietal wall bears a small callous nodule near the posterior angle of the aperture*, separated from the lip by a narrow channel. The coloring is similar to the patterns of the group of *A. porcellanus*.

A. CONTRARIUS (Müller). Pl. 68, figs. 22–27.

Shell umbilicate or perforate, sinistral, oblong turreted, thin but moderately solid, polished and glossy, faintly striatulate above, somewhat coarsely wrinkle-striate on the base. Ground-color of a pale flesh-tint, white on the spire, flammulate with *oblique purple-brown stripes which do not reach to the suture above, and are bisected by a yellow band (white on the spire) which revolves midway between sutures*, and frequently has dark borders on the last whorl; the flames abruptly terminating at *a wide yellow band revolving below the periphery, and bordered above and below with narrow dark bands;* a large flesh-colored basal area below the band. Whorls about 6, *quite con-*

rex, the first one *black;* penultimate and last whorls strongly convex; suture impressed, marked by a white line below, which is often bordered by an indistinct pink band. Aperture small, oblique, showing the bands within; peristome white both inside and out, reflexed, thin; columella oblique, its outer margin triangularly reflexed above, continued some distance as a thickened ledge upon the parietal wall. Parietal callus thin, showing the bands through, *thickened at the edge below and near the posterior angle, where there is a subtriangular tubercle, separated from the termination of the outer lip by a deep but narrow channel, which continues along the suture inside* (fig. 25).

Alt. 36, diam. 19, longest axis of aperture 18 mill.

Alt. 34, diam. 16, longest axis of aperture 16 mill.

Alt. 24½, diam. 15 mill.

Timor: *Southern part of the island from Kupang and Babauw inland to Okabita*, not uncommon (v. Martens); *Pariti and Taimanan* (Gazelle Exped.); *Amarassi* (Dr. H. Ten Kate; a variety?) Rotti (a small island near the west end of Timor): *Talae* (A. Wichmann).

Helix contraria Muller, Verm. Hist. ii, p. 95.—Gmelin, Syst. Nat. (13), p. 3644.—Férussac, in Freycinet's Voy. autour du Monde, l'Uranie et la Physicienne, Zool., p. 474, pl, 67, f. 8, 9.—*Helix interrupta sinistrorsa*, etc. Chemnitz, Conchyl. Cab. ix, p. 101, f. 938, 939 (Müller's type).—*H. interrupta* var. Dillwyn, Catal., ii, p. 937.—*Bulimus interruptus* var. Brug., Lam.—Küster, Conchyl. Cab. p. 14, pl. 9, f. 5, 6 (copied from Chemnitz).—Hombron & Jacquinot, Voy. au Pol Sud, Moll., pl. 8, f. 1.—*Bulimus contrarius* Desh, in Lam., An. s. Vert., viii, p. 226; in Fér. Hist., p. 19, pl. 161, f. 10, 12, 13.—Mousson, Moll. Java, p. 110.—Pfr., Zeitschr. f. Malak., 1849, p. 138; Conchyl. Cab. p. 136, pl. 41, f. 3, 4; Monogr. iii, p. 327; iv, 384; vi, 30; viii, 46 (always exclusive of varieties).—Martens, Ostas. Landschn, p. 363, pl. 21, f. 7*a*, *b*, *c*, 10, and var. *subconcolor*, p. 365, pl. 21, f. 9 (1867); Mal. Blätt. x, 1863, p. 171; Monatsber. K.-P. Akad. Wissensch. zu Berlin, 1877, p. 278 (1878).—*Orthostylus contrarius* Beck, Index Moll. p. 50.

Amphidromus contrarius Wallace, P. Z. S., 1865, p. 412.—Semper, Reisen in Archip. Phil., iii, p. 147, pl. 16, f. 24 (dentition).—Schepman, Notes Leyden Mus. xiv, 1892, p. 153.—Martens, in Weber's Zool. Ergebnisse einer Reise in Niederländisch Ost-Indien, ii, p. 241; *and* F. Wiegmann, iii, p. 208, pl. 15, f. 12–17 (anatomy).—Fulton, Ann. Mag. N. H. (6), xvii, p. 77 (exclusive of varieties).

The long spire, very convex whorls, and especially the nodule on the parietal wall close to the posterior angle of the aperture, are characteristic; and while the color-pattern varies within rather wide limits, it does not merge into that of *porcellanus*. Generally there are two distinct yellow bands on the last whorl, the lower one much wider and bounded by dark bands; but there is a good deal of variation in the flame markings, and the rose color of the base and subsutural band fades rapidly after death, as von Martens remarks. Fig. 23 is the typical coloration.

Var. *subconcolor* Martens. Pl. 65, fig. 28.

Entirely like slender individuals of *contrarius* in contour, thickness and gloss of the shell, and peristome, but nearly uniform yellowish white, more yellow toward the base, where the two pomegranate-yellow bands of *suspectus* appear, similar in position to the two citron-yellow ones of *contrarius*. No trace of streaks or black bands, but the apex is purple-black, as in *contrarius*, *suspectus* and *lævis*.

Kupang, Timor, one adult and three young specimens (Martens).

B. contrarius var. subconcolor Martens, l. c.—*A. lævis*, part, Fulton, t. c. p. 76.

The ledge and superior nodule of the parietal wall show this to belong to *contrarius*, not to *lævis* as Fulton stated. The specimens were collected by von Martens himself.

Var. *crassus* Fulton. Pl. 65, fig. 29.

"This shell is similar in shape to the typical form, but is a much more solid shell; the columella is thick and round, not thin and expanded as in the type; whilst the aperture is somewhat higher in proportion to the height of the shell, and the interrupted oblique color-stripes of the type are absent on the last whorl of this species. Diam. 20, alt. 40 mill." (*A. contrarius* var. *crassa* Fulton, Proc. Malac. Soc. Lond. iii, p. 213, 215, pl. 11, f. 8, March, 1899.)

Oinainisa, southwestern Timor (Everett).

The typical form also occurred at the same place.

A somewhat remarkable variety of *contrarius* is represented by a single specimen before me bearing the locality "Pegu," probably incorrect. It has the characteristic tubercle at the posterior angle, but the shell is very solid, abnormally elongated, with the two basal bands interrupted and the light band of the upper surface obsolete on the last whorl (pl. 65, fig. 24).

A. SUSPECTUS (von Martens). Pl. 65, fig. 30.

Shell sinistral, ovate-conic, rather solid, lightly striatulate, glossy; buff-whitish, with *two black bands on the base and two sulphur-yellow ones*, the umbilical region roseate, *apex broadly marked with brown-black*. Whorls 6, rather convex. Aperture ovate, three-sevenths to four-ninths the length of the shell, peristome moderately thick, narrowly expanded. *violaceous-brown;* columellar margin broadly dilated, reflexed, paler; *parietal callus forming a little tooth above at the insertion of the lip.* (*Mart.*)

Alt. 31, diam. 17½, aperture 14 mill.

Alt. 27½, diam. 14, aperture 13 mill.

Alt. 24½, diam. 12½, aperture 11½ mill.

Alt. 34½, diam 18, aperture 16½ mill.

Timor: *Kupang*, in company with *A. contrarius* (Martens, Wichmann.

Bulimus suspectus MARTENS, Monatsber. Akad. Wissensch., Berlin, 1864, p. 526; 1877, p. 279; Ostas. Zool. Landschn., p. 362, pl 21, f. 8.—PFR., Monogr., vi, p. 27.—*A. suspectus* SCHEPMAN, Notes Leyden Mus., xiv, 1892, p. 153 (Soemba I.).—MARTENS, in Weber's Zool. Ergebnisse einer Reise in Niederländisch Ost-Indien, ii, p. 241. —FULTON, Ann. Mag. N. H. (6), xvii, p. 78, with var. *albolabiata*, p. 79, pl. 6, f. 9.

Close to *A. contrarius* in having a nodule at the posterior angle of the aperture, but, as Fulton says, it "differs in coloration, being white above with two dark brown and two pale yellow bands on the last whorl, the topmost yellow band being continued above; lip and columella pink." I think it would be more justly ranked as a variety of *A. contrarius*.

Schepman's single young specimen from Sumba Island may not be this species, as the characteristic tubercle at the mouth angle is not developed until maturity.

Var. *albolabiatus* Fulton. Pl. 65, fig. 31.

"Differs from *suspectus* in being larger, in having a *white lip and columella*, and only two dark-brown bands on last whorl, the upper being continued at the suture of the upper whorls." (*Fulton.*) *Timor.*

16. *Group of A. columellaris.*

A. COLUMELLARIS Moellendorff. Pl. 65, figs. 32, 33.

Shell sinistral, narrowly perforate, *slenderly* conic-oblong, rather

solid, very lightly striatulate, glossy. *Pale yellow, painted with rather wide green stripes,* sometimes interrupted, and brown above, and *encircled by three rose colored bands*, one at the suture, another below the periphery, and a third at the umbilical region; with generally other green, rarely brown bands. Spire turreted-conic, the apex rounded, black. Whorls 7, rather flat, slowly increasing, separated by an appressed, white-margined suture; the last whorl a little ascending in front. Aperture slightly oblique, narrow, somewhat auriform; peristome but little expanded, white-lipped within, the margins joined by a thin, pellucid callus. *Columella strongly spirally twisted*, revolute at the perforation. (*Mlldff.*)

Length 32, diam. 14, longest axis of aperture 14 mill. (*Mlldff.*)

Tenimber Is. (W. Micholitz.)

A. columellaris Mlldff., Nachrbl. d. Malak. Ges., 1892, p. 99, pl. 1, f. 9.—Fulton, Ann. Mag. N. H. (6), xvii, p. 79.

The particular island whence the types came is not recorded. Dr. von Moellendorff found the specimens, about 24 in number, to vary but little in form or coloration. The three roseate bands were present on all of them. The convexly twisted columella is a remarkable character.

Fulton writes that he has "some light colored specimens without the narrow red band at suture, under the manuscript varietal name of *gloriosa* Bttg." Other specimens have red bands at suture and columella, but none at the periphery, the base with two bluish-green zones separated by a yellow band; the stripes above bluish-green or black-brown, bisected midway by a narrow light band, the first whorl black, the next brown. Lip and columella are white, the latter with only slightly convex edge (fig. 33). This may be called var. *sierahensis*. It is from Sierah Island.

17. *Group of A. lævis.*

A. lævis (Müller). Pl. 66, figs. 49–54.

Shell sinistral, umbilicate, ovate-turreted, rather solid, nearly smooth, glossy. *Yellow*, varying from lemon to tawny (or rarely almost white), frequently fading to white on the spire, *encircled by two orange bands*, sometimes very faint, and occasionally with a third, subsutural band. In addition to these, three or four purple or red-brown or greenish bands are often developed between the orange ones, and there may be a red line below the suture and a fleshy-

purple umbilical area. Apical whorls reddish, fleshy or white, usually with a terminal black spot. Whorls 6 (to nearly 7), convex, the last inflated. Aperture small, oblique, flesh-tinted inside; peristome white, narrowly reflexed, the columellar margin triangularly dilated; columella oblique, a little convex; parietal callus thin and quite transparent.

Alt. 29, diam. 15, longest axis of aperture 13½ mill.

Alt. 36, diam. 17½, longest axis of aperture 17 mill.

Alt. 43, diam. 20, longest axis of aperture 18 mill.

Moluccas: *Keffing Is.*, off the eastern end of Ceram (Capt. Schulze).

Helix læva Muller, Verm. Terr. Hist., ii, p. 95.—Chemnitz, Conchyl. Cab., ix, p. 103, pl. 111, f. 940–949.—Gmelin, Syst. Nat., p. 3644.—Dillwyn, Descript. Catal., ii, p. 935.—*Bulimus lævis* Brug., Encycl. Méth., i, p. 317.—Kuster, Conchyl. Cab., p. 15, pl. 9, f. 9–16.—Pfr., Monogr., ii, p. 39; Zeitschr. f. Malak., 1849, p. 138; Monogr., iii, 321; iv, 382; vi, 27.—Reeve, Conch. Icon., pl. 37, f. 216 *b*.—Mousson, Moll. Java, p. 110.—Desh. in Fér., Hist., ii, p. 18.—Martens, Ostas. Landschn., p. 359 (1867). —*Bulimus* (*Amphidromus*) *lævis* Müll., Tapparone-Canefri, Ann. Mus. Civ. di Storia nat. di Genova, xx, 1884, p. 146.—*Amphidromus lævis* Müll., Martens, Monatsber. K. P. Akad. Wissensch. zu Berlin, 1877, p. 279, and in Weber's Zoölogische Ergebnisse einer Reise in Niederländisch Ost-Indien, ii, p. 251 (1891).—Fulton, Ann. Mag. N. H. (6), xvii, 76.

Usually banded in rather gaudy colors on a yellow ground, two rather faint orange bands being especially constant; and further differing from its allies in never being flammulate or obliquely striped. It varies interminably in color and band-pattern.

Although known to naturalists of the last century, the locality of this species still remains uncertain. Timor, the Tenimber islands, and the Moluccas have all been given as its habitat, but lack confirmation by recent collectors. The locality Keffing Is. is upon the authority of a German who, returning from the Dutch East Indies, assured Prof. von Martens that it came from that place. The specimens in collections were collected by Malays, and obtained at the seaports, from Singapore down. It must be abundant where found. The name *lævis* would be as appropriate to most *Amphidromus*, as nearly all the species are smooth.

Amphidromus kobelti Rolle (Nachrbl. d. D. Malak. Ges., April, 1893, p. 34) is considered a synomyn by Fulton, but from his remark on its coloration it is evident that he had not seen a typical specimen. The original description is as follows: shell rimate-perforate, sinistral, ovate-conic, obliquely striatulate; *buff with two brown bands on the whorls of the spire*, a very narrow one above the suture and a wider one in the middle; *the last whorl having a third and wider band below the periphery;* spire whitish, apex small, submammillate. Whorls 6, regularly increasing, a little convex, separated by a linear suture, the last whorl nearly as long as the spire, a little inflated. Aperture very oblique, angularly ovate-semilunar, buff in the throat; peristome callous, white, the margins joined by a very thin callus; left margin well arched, reflexed, forming an angle with the columellar margin, which is vertical, callous, and dilated above, roofing over the perforation. Alt. 32, diam. 20 mill.

The locality is unknown. The form and coloring described lead me to agree with Fulton that this is identical with *lævis*, though the dimensions differ a little from ordinary specimens; a normal *lævis* before me 32 mill. long is only 16 mill. in diameter. However, von Martens gives alt. $30\frac{1}{2}$, diam. 19 mill. as the measurements of a specimen, and this is as wide as *kobelti*.

18. *Group of A. adamsi.*

Rather small, sinistral, imperforate or but slightly rimate shells, varying enormously in color and pattern, but no doubt of common ancestry; characteristic of Borneo, but spreading across Balabac Strait to the islands or mainland of southwestern Paragua (Palawan), and on the other side reaching Sumatra and Java. Illustrated on plates 66, 69, 70, 71.

A wonderful series of forms, remarkable even in *Amphidromus* for the instability of coloration. The species are largely arbitrary, for while extreme forms may be remarkably distinct, there are many connecting specimens. In the group of forms included under *A. quadrasi* the intergradation is demonstrated by series before me; but the subspecies of the *A. adamsi* group probably have true racial value.

A. FURCILLATUS (Mousson). Pl. 66, figs. 38, 39, 40.

Shell sinistral, long-conic, subperforate, smooth, glossy; buff-white with grayish-brown flames. Whorls 7, a little convex, regularly in-

creasing, the tip of the apex black; last whorl two-fifths the length, uniform or spirally two-banded below, flammulate above, the flames bifurcate or trifurcate, disappearing at the suture. Aperture ovate, white, showing the bands through; parietal wall yellowish; peristome thin, reflexed, white, joining the straight and slender columella at an angle, nearly covering the perforation. Alt. 35, diam. 18.2 mill. (*Mousson*).

Java: *Coffee plantation of Pangang-Lele* (type locality); *Litgin and Rogodjampi*, in the Banjuwangi residency (Zollinger); *Mt. Lamongan* Probolingo residency (F. Jagor); and *Balong*, Bezuki residency (Dr. Semmelink). Bimah I. (Zollinger).

Helix læve Chemnitz, Conchyl. Cab. ix, f. 949.—*Bulimus lævis* (in part) Reeve, Conch. Icon., f. 216*a*.—Küster, in part, Conchyl. Cab., pl. 9, f. 16.—*Bulimus elegans* Mousson, Moll. Java, p. 32, 110, pl. 3, f. 3 (1849); not *B. elegans* Pfr.—*B. furcillatus* Mouss., t. c., p. 115 (1849).—Martens, Ostas. Zool., Landschn., p. 357, with var. *flammulatus* (= typical *furcillatus*) and *virescens*, p. 358, pl. 21, f. 3.—*B. contrarius* var. *b*, Pfr., Monogr. iii, p. 327.

Amphidromus furcillatus Mouss., Fulton, Ann. Mag. N. H. (6), xvii, p. 76.

Mousson's original description, translated above, was from a specimen in rather poor condition, according to Fulton; the ground-color having faded. In fresh specimens the ground is buff, with a rather wide pale zone below the suture (which has a yellow or sometimes pink margin), and fading to whitish on the spire. This ground on the last whorl is closely and more or less conspicuously streaked with grass-green lines. The purple-brown oblique stripes or flames are forked or broken into three branches above, with great regularity, upon the pale belt below the sutural margin. When these flames continue to the aperture, we have typical *furcillatus*, but when they fade upon the last whorl, and the green streaks are conspicuous there, it is the form *virescens* (figs. 38, 39). In the typical form the bases of the purple-brown stripes may be more or less united by a spiral band, and sometimes there is another defining a small dull reddish columellar area. This area is to be seen also in the var. *virescens*. Fig. 40 is a copy of the type figure.

The coloration is strikingly like certain forms of *A. quadrasi*.

A. andamanicus ('Thorp,' Hanley & Theobald). Pl. 66, fig. 41.

Defined by a figure, in which the last whorl is green-striped on a

yellowish ground, marked by a reddish-brown sutural band; the spire is buff with oblique chestnut stripes, which are simple, *not forked above;* 3 or 4 earlier whorls uniform buff. "The aperture is white with a broad purple-lake band above the pillar." It is sinistral. *Andaman Is.* (Hanley & Theobald).

Bulimus andamanicus Thorp, MSS., Hanley & Theobald, Conchologia Indica, p. 59, pl. 148, f. 10 (1876 or earlier).—*Amphidromus sp.*, Nevill, Handlist of Moll. Ind. Mus., pt. 1, p. 127, no. 21 (1878).—*A. furcillatus var. andamanica* Fulton, Ann. Mag. N. H. (6), xvii, p. 77.—*A. andamanicus var. nicobarica* Nev. MS., Godwin-Austen, P. Z. S., 1895, p. 443, 450.

The similarity in coloring to *A. furcillatus* and *A. quadrasi* is remarkable, but on account of the widely separated localities it may be inadvisable to unite *andamanicus* with either, without full investigation. I have not seen the species, and no sufficient account of it has been published.

Godwin-Austen says of var. *nicobaricus* 'Nevill' G.-A.: "Of this species I have one specimen from Katchall (Nicobar Is.). It is somewhat larger than Andaman shells, and in color is far paler, and with few markings, and those pale. These differences might not hold good in a large series."

Fulton states that *andamanicus* varies "from very light to quite a dark color." The figure is a copy of the original.

A. sumatranus (Martens). Pl. 66, figs. 35, 36, 37.

Shell sinistral, long-conic, smooth, *very glossy;* buff-whitish, marked with a row of brown spots, and on the base two or three brown bands, the apex pale. Whorls 6, *nearly flat.* Aperture ovate, three-sevenths the length of the shell; peristome rather thick, white, somewhat widely expanded; no parietal callus; columellar margin slender, straight, nearly perpendicular, making a distinct angle with the basal lip, at the insertion narrowly reflexed and flatly adnate. (*Martens.*)

Length 33, diam. 17, aperture 15 mill.

Length 27, diam. 14½, aperture 12 mill.

Sumatra: *central mountain region near Kepahiang* (Martens); *Indrapœra* (Weyers, figs. 36, 37); *Silago* (Snellman).

Bulimus sumatranus Martens, Monatsber. Berl. Akad. Wissensch., 1864, p. 526; Ostas. Zool., ii, p. 366, pl. 21, f. 6.—Pfr.

Monogr., vi, p. 27.—Schepman in Veth's Midden Sumatra, Moll., p. 8 (1880).—*A. sumatranus* Mart., Fulton, t. c., p. 88 (1896).—Dautzenberg, Ann. Soc. Roy. Malac. Belg., xxxiv, p. 6, pl. 1, f. 2, 2 *a* (1899).—? *Bulimus* (*Amphidromus*) *adamsi* Reeve, Bock, P. Z. S., 1881, p. 630.

The shell is smoother and more glossy than other members of the group, the last whorl bluntly angular. The upper two-thirds of the last whorl, and the visible portion of the preceding whorls, is yellowish gray-white, with one or two white bands with regularly spaced brown spots; the upper band (sometimes absent) runs below the preceding suture, the lower close above the following suture and at the periphery of the last whorl; and besides there are pale grayish nebulous streaks, forked above (y-like), and ending below in the spots of the lower band. If these cloudy markings were brown, the pattern would resemble that of *A. furcillatus*. At the base of the last whorl there are three narrow blackish spiral bands, the space between the first and second yellowish brown, that between the second and third whitish yellow. The third band frequently is lighter, even green; and the umbilical tract defined by it is not roseate, but of a greenish-yellow color, darker than the rest of the shell.

It is likely that the shells collected by Mr. C. Bock at Sidjoendjoeng, Paio, etc., in the Padang district, and identified as *A. adamsi*, were really *A. sumatranus*, but no details of color, etc., are given. See under *A. adamsi* var. *pictus*.

A. semifrenatus Martens.

A peculiar form, between *porcellanus* and *sumatranus*, having the slender contour in common with the former, and in a few specimens the two wide brown bands on the base; but the upper surface of the last whorl and the visible part of those preceding is more similar to *sumatranus*, being pale greenish or bluish white, with small pale brown spots in one or two spiral rows. The last whorl is more yellow throughout than in the two species named, and the brown bands may vanish to a greater or less extent, but in that case there still remains of the lower one *a narrow black-brown bandlet which winds around the insertion of the columella, and is continued on the outer side of the peristome to the middle of its height*. A few examples are otherwise quite uniform yellow, but show this dark brown columellar bandlet and this dark brown streak behind the reflection of the white per-

istome. This does not occur in *porcellanus* or *sumatranus*, so far as 16 of the former, 3 of the latter show. There are three pattern-varieties :

(*a*) Two brown bands on the under side, two rows of paler spots on the visible portion of the earlier whorls. (*b*) Bands of the under side vanished, excepting the narrow one about the columella; the two spot-rows of the upper whorls equally distinct in one specimen, in the other disappearing on the penultimate whorl, very pale on the two preceding. (*c*) Uniform yellow except for the band around the columella and behind the lip. (*Martens.*)

Sumatra: *Deli* (L. Marten, form *a*); *Sukaranda, Upper Lankat* (Schneider, forms *b* and *c*).

Amphidromus semifrenatus MARTENS, Nachrbl. d. d. Malak. Ges., xxxii, p. 8 (Feb., 1900).

A. HOSEI Smith. Pl. 63, fig. 89.

Shell small, rimate, sinistral, elongate, conic; a narrow reddish-purple line encircling the middle of the last whorl, and above the suture, and toward the apex spotted with brown, under a very thin pale yellow cuticle. Whorls 7, a little convex, striated with very delicate, oblique growth-lines, slowly and regularly increasing, the last one short, stained with black around the narrow umbilical chink. Aperture inverted auriform, pale yellowish with a median reddish-purple line, a little exceeding one-third the total length of the shell; peristome white, narrowly expanded and reflexed, the columellar margin thickened and narrowly dilated. Length 31, diam. 14, aperture 11 mill. long. (*Smith*).

Borneo: *Meri*, *Sarawak* (C. Hose).

Amphidromus hosei E. A. SMITH, P. Z. S., June, 1895, p. 115, pl. 3, f. 20.—FULTON, t. c., p. 81.

"A small species, rather like *A. suspectus* Martens, from Timor and Sumbawa. It is differently colored, the increase of the whorls is slower, and the body-whorl and aperture are smaller. The apex is not black, and the fourth and fifth volutions exhibit some pale brown spots or stripes. Only a single specimen examined" (*Smith*).

"Near *flavus* in form, with a thin yellowish green epidermis as in *sylheticus*, but easily distinguished from both by the single color-band encircling the last whorl" (*Fulton*).

A. ADAMSI (Reeve). Pl. 69, figs. 32–50; pl. 66, figs. 44, 45.

Shell ovate-conic, sinistral, imperforate, thin, variously colored (see below), but generally with a distinct *yellow or reddish border below the suture*, and a pink or *purple umbilical area;* many forms with yellow or reddish bands above and below the periphery. Glossy, slightly striatulate, and showing excessively fine spiral striæ under a lens, the apex punctulate. Whorls about 6, slightly convex, the last rather swollen, aperture ovate, oblique, white or marked with dark brown inside; the peristome thin, expanded, white; columella usually carmine or purple, slender or straight, narrow below, suddenly dilated and appressed above; parietal callus a mere colorless varnish.

Islands on the Borneo side of Balabac Strait, and N. Borneo.

Bulimus adamsi REEVE, Conch. Icon. pl. 13, figs. 73 *a*, *b*, *c*, *d* (June, 1848).—ADAMS & REEVE, Zool. 'Samarang,' Moll., p. 58, pl. 15, f. 1.—PFR., Monogr. iv, 385; vi, 32; viii, 46; Conchyl. Cab., p. 89, pl. 31, f. 11, 12.—MARTENS, Ostas. Landschn. p. 356, var. A and D; not the description.—*Bulimus moniliferus* Gld., PFR., Monogr. iii, p. 328 (exclusive of reference to Gould); not *B. moniliferus* Gld.—*Amphidromus adamsi* Reeve, FULTON, Ann. Mag. N. H. (6), xvii, p. 82, with varieties *subunicolor* "Martens," p. 5, f. 5; *articulata*, pl. 5, f. 7; *duplocincta*, pl. 5, f. 4; *luteofasciata*, pl. 5, f. 2, 2 *a*; *ornata*, pl. 5, f. 14; p. 83, var. *rufocincta*, pl. 5, f. 1; *superba*, pl. 5, f. 10; *simplex*, pl. 5, f. 12; *inornata*, pl. 5, f. 6; *aureocincta*, pl. 5, f. 3, 3 *a* (Jan. 1896).

An extremely variable species, the limits of which may well be amplified to include *hamatus*, *placidus*, *angulatus* and *pictus* as subspecies. The forms from Banguey and an islet between that island and Balambangan are merely color-phases of the typical form, similar in rank to those of *Ligus fasciatus*, described in Vol. XII of this work, and deserving names neither more nor less than these. On the mainland of Borneo a number of forms occur which may be considered either species or sub-species, at the option of the naturalist; for while their actual intergradation with typical *adamsi* may not as yet be proven, the variation known renders it highly probable that intergradation occurs. The species was named in honor of Arthur Adams.

Typical form. Pl. 69, figs. 32, 33. Thin, smooth; white or grayish with three yellow bands, one below the suture, others above

and below the periphery, the latter enclosing a peripheral series of squarish or long brown spots alternating with white intervals, which appear above the suture on the spire; a purple area surrounding the columella; several early whorls and the apex white. Alt. 30, diam. 16, aperture 14½ mill.

Islet between Banguey and Balambangan, Balabac Strait, N. E. Borneo, on a tall tree (A. Adams).

There is some pink color back of the lip in some specimens. The figures in the zoölogy of the Samarang and figs. 73 *a*, *b* of Reeve represent this form. My fig. 33 is also drawn from a specimen of the original lot.

In the same locality specimens (pl. 69, fig. 34) occur of a yellow color, paler above, and with a yellow subsutural band *but otherwise bandless;* the columellar patch and white apex as in the typical form. Reeve's figs. 73 *c*, *d*, represent this form.

Color-varieties from Banguey Island.

Form *subunicolor* Fulton (pl. 69, fig. 35). "Yellow; lip, columella and umbilical area pink; third and fourth whorls plain or ornamented with a reticulated band just above the suture." In specimens received from the author there is a broad white band above, the apical whorls are pink, with sometimes a blackish terminal dot, and the outer lip is white with a purple spot at the angle. Fulton wrongly gives von Martens as the authority for the name. When the spot band of the early whorls is continued upon the last, this becomes

Form *articulatus* Fulton (pl. 69, fig. 36). "Like *subunicolor*, but with a band composed of square dark-brown spots encircling the periphery and continued at the suture of upper whorls; ground-color may be either yellow or reddish-brown."

Form *duplocinctus* Fulton (pl. 69, figs. 37, 38). Ground-color either yellow or reddish-brown, with two narrow purple-brown bands, one peripheral, often showing above the suture on the spire, the other on the base, generally split. Columella and area carmine, lip and apical whorls pink. The brown form has a light-red subsutural border, and sometimes there are two series of brown spots on some early whorls.

Form *simplex* Fulton (pl. 69, fig. 44). "Ground-color lemon, which is sometimes suffused with orange; a pink spiral band below the suture; upper whorls either plain or with some brown spots above the suture of third and fourth whorls. Length 26, diam. 15 mill."

Form *ornatus* Fulton (pl. 69, fig. 41). "Ground-color either yellow or reddish-brown, with a broad spiral band of short oblique equidistant dark-brown stripes at the periphery, continued above at the suture; lip, columella and umbilical area pink."

Form *luteofasciatus* Fulton (pl. 69, figs. 39, 40). Yellow bands below the suture and above and below the periphery, and a pale band around the purple columellar tract, the intervals between bands of a peculiar drab or bluish color, sometimes with distant white spots along the peripheral band; two series of brown spots on some early whorls; a dark apical dot. Lip and columella pink. Allied to the following.

Form *superbus* Fulton (pl. 69, fig. 43). "A most beautiful variety of a bluish-grey ground-color, ornamented with three spiral color-bands, a pink one just below the suture, one, either yellow or pink, at the centre of the whorls, and the third (a yellow one) at the lower part of the last whorl; on the upper whorls are oblique stripes, which are interrupted by the spiral bands; lip, columella and umbilical area pink." (*Fulton.*)

Form *mangsianus* Pilsbry (pl. 66, figs. 44, 45). Short and ventricose, thin; whitish with yellow suffusion toward the base and lip, and a golden subsutural band; marked with deeply branching brown flames interrupted on the base by a yellow belt, the columellar area reddish. Another color-form has the same ground-color, but with merely traces of the flames appearing as spots above the suture and on the upper part of some early whorls, the last whorl with a subperipheral and a basal dark interrupted line.

Island of Mangsi, Balabac Strait.

Bornean forms.

Form *rufocinctus* Fulton (pl. 69, fig. 42). "Ground-color fawn or light brown, with three pink spiral bands, one immediately below the suture, and the other two above and below the periphery, the upper one continued above." Columellar patch carmine, lip and columella pink.

Form *inornatus* Fulton. Pl. 69, fig. 45.

"Thin, pale lemon color, first three whorls semitransparent, and with some oblique and more or less indistinct brown stripes; *subangulate at the periphery;* suture slightly channelled; lip and columella white; umbilical area sometimes tinged with pink."

North Borneo.

Subsp. AUREOCINCTUS Fulton. Pl. 69, figs. 46, 47, 48.

Shell more solid and often more elongated than *adamsi;* yellowish fawn, rather streaked below, fading to whitish on the upper part of the last whorl and the spire, the suture with a golden border below; umbilical region golden or purple. Aperture, lip and apex white: columella white or purple.

Length 41, diam. 16 mill.

Length 36, diam. 18 mill.

Length 29, diam. 14 mill. *North Borneo.*

Subsp. RUBIGINOSUS Fulton. Pl. 69, figs. 49, 50.

Imperforate or nearly so, oblong-conic, *rather solid*, striatulate, hardly striated spirally. Dead-leaf brown, streaked with darker, fading to whitish on the upper part of last whorl and on the spire. Sometimes having irregularly bent brown stripe markings on the spire and some spots at the periphery, the suture plain or with a reddish brown line near it below; apex white, sometimes with a dark dot. Lip and columella white, the latter surrounded by an obscure or blackish area. Whorls $6\frac{1}{2}$.

Length 38, diam. 20, longest axis of aperture $17\frac{1}{2}$ mill.

Length 33, diam. 17, longest axis of aperture $15\frac{1}{2}$ mill.

North Borneo.

A. adamsi var. *rubiginosa* FULTON, Ann. Mag. N. H. (6), xvii, p. 84 (Jan., 1896).—*Bulimus lævis*, in part, DESHAYES, in Fér., Hist. pl. 161, f. 11, 14, 15, 18.

This very distinct variety resembles var. *aureocinctus* in solidity and the dull coloration. It is sometimes irregularly striped above, sometimes stripeless save for some basal streaks. The absence of a sutural border is noteworthy. It is a wider shell than *A. sinistralis*, with different columella and closed umbilicus.

Subsp. HAMATUS Fulton. Pl. 70, figs. 51–60.

Minutely rimate or subimperforate, *thin;* yellow or flesh colored, *with a subperipheral brown band from which short curved flames arise,* the surface above th m unicolored, or the flames may be continued in irregular stripes to the suture, and some short ones intercalated above; varying to forms without flames or without any markings. But *there is never a band bordering the suture below,* as in *adamsi.* A small purplish umbilical crescent or none. Periphery usually

noticeably angular in front. Aperture marked within, the lip thin, white.

Length 27, diam. 15 mill.

Length 22½, diam. 12 mill.

Labuan Island, off north coast of Borneo.

A. hamatus Fulton, Ann. Mag. N. H. (6), xvii, p. 84, pl. 5, f. 13 (Jan. 1896).—*Bulimus adamsi*, var. E and F, Issel, Molluschi Borneensi, in Annali del Museo Civico di Storia Naturale di Genova, vi, p. 413, pl. 5, f. 28, 29 (1874).

Rather more fragile than *adamsi*, but differing chiefly in the different development and variations of the color-pattern. It has not the three yellow bands so frequent in *adamsi*. The flames along the periphery are usually hooked, from which character the name was given.

In the large series before me there is every gradation between uniform yellow or fleshy specimens and elaborately striped and banded. Beginning with examples striped above and one or two banded below (fig. 51), the pattern changes by loss of the narrow stripes on the upper surface, then diminution of the peripheral hooked flames (figs. 53–57), and finally narrowing and disappearance of the spiral bands (fig. 58). Enough figures are given to show the chief stages in the loss of brown pattern, but in the series before me the change is seen to progress by such gradual steps that it would be absurd to define "varieties."

This Labuan form was first noticed by Issel, who gives two good figures. Schepman has noted the occurrence of a similarly marked specimen collected by the Dutch Borneo-Expedition at Sintang (Notes Leyden Mus. 1895, xvii, p. 156), where one would expect the forms of subsp. *pictus;* but doubtless the Sintang form is what von Martens records from Mandhor, as transitions between the spot-girdle form and that with wide green-gray stripes.

Pl. 70, fig. 60, is Fulton's type of *hamatus*.

Form *placidus* Fulton. Pl. 70, fig. 64.

"Shell sinistral, broadly conical, slightly perforate, thin, obliquely striate, somewhat angulate at the periphery; whorls 6, slightly convex, apex brown, apical whorls white, lower of a pale lemon color; columella straight, rather thin, slightly expanded, white at upper part; lip pale purple-brown, expanded and slightly reflected. Long. 31 mill., maj. diam. 16 mill." (*Fulton*). *East Borneo.*

A. placidus Fult., t. c., p. 84, pl. 5, f. 11 (1896).

Seems to be hardly separable from the last except by the tinted lip. Type in British Museum.

Subsp. angulatus Fulton. Pl. 70, fig. 61.

"Shell sinistral, ovate-conic, thin, *more or less sharply angulate at the periphery*, obliquely striate, umbilicus almost covered; whorls $6\frac{1}{2}$ to 7, slightly convex; color either fawn with oblique brown stripes on upper whorls or pale yellow with bluish-green stripes, banded at lower part of last whorl; columella white, straight, rather thin; lip somewhat expanded, white; interior of aperture dark brown." (*Fulton.*)

Long. 37 mill., maj. diam. 20 mill.

Long. 35 mill., maj. diam. 19 mill. *Sarawak, Borneo.*

A. angulatus Fult., t. c., p. 84, no. 42, pl. 6, f. 3 (1896).

"Chiefly distinguished by its dark coloration and angular periphery. I think it probable that *hamatus*, *placidus*, and *angulatus* are only varieties of *Adamsi*." (*Fulton.*)

A. pictus Fulton. Pl. 70, fig. 62.

Shell sinistral, subimperforate, conic, moderately solid, polished. Ground color yellow, fading to corneous on the earlier $1\frac{1}{2}$ whorls, the next whorl with reddish-brown stripes, following whorls covered with *broad, oblique bluish-gray or brownish-gray stripes*, which but rarely fork, the *last whorl broadly striped above, having a more purple-gray band below the periphery and another on the base, a red crescent encircling the whole columella.* Suture with a very narrow light border below. Whorls $6\frac{1}{2}$, the apex with a brown dot. Aperture deep purple-brown within, with white bands and stripes; peristome reflexed, white. Columella triangularly dilated, white or tinted.

Length $34\frac{1}{2}$–$37\frac{1}{2}$, diam. 19, longest axis of aperture 17–18 mill.

Length 37, diam. 17 mill.

Kina Balu, North Borneo; also *Sarawak territory* (Doria & Beccari).

A. pictus Fult., t. c. p. 85, pl. 5, f. 8; with var. *conciana* pl. 5, f. 9 (1896).—*B. adamsi* Martens, Ostas. Zool., p. 357, pl. 21, f. 5b. —Issel, Ann. Mus. Civ. Genov., 1874, p. 413, "*individuo raccolto a Sarawak.*"

Form *concinnus* Fulton. Pl. 70, fig. 63.

"Color bluish-grey, with a dark-green zone encircling lower half

of the upper whorls, interrupted by equidistant, short, oblique stripes; this interrupted band is continued on last whorl at the periphery; lip and columella pink. Compared with *pictus* the whorls are *more convex*, the aperture smaller; the basal bands are sometimes absent in this variety." (*Fulton.*) *Kina Balu.*

Form . . . (pl. 64, fig. 18). With very broad and confluent greenish-gray stripes, leaving very narrow vertical buff intervals; an indistinct whitish sutural zone.

Singkawang, on the west coast of Borneo (Martens).

B. adamsi var. C. MARTENS, Ostas., p. 357, pl, 21, f. 5 *a*.

Differs from the preceding by its want of spiral bands on the base. It is very widely separated geographically.

Further inland, at Mandhor, von Martens obtained pale buff specimens ("var. B") with greenish-gray rather wide continuous stripes, forked above, without a sutural zone. They occurred with transitions toward the above described form, and toward the marking of typical *adamsi*.

Schepman (Notes Leyden Mus., xvii, 1895, p. 156) reports specimens agreeing with this form from the foot of Mt. Tiloeng (Büttikofer), and Mounts Dadap and Sekedau, Ketoengau River (Moret), collected during the Dutch Borneo Expedition (*A. adamsi;* Notes Leyden Mus., xvii, 1895, p. 156). These localities are in the interior of Dutch Borneo west and southwest.

It is clear that forms referable to the general type of *pictus* occur in the interior, from Mt. Kina Balu in British North Borneo to western and southwestern Borneo; and at the present stage of our knowledge it is probably inadvisable to give names to isolated color-forms, which are likely to prove mere individual phases of no truly racial character.

Color-form *connectens* Fulton. Pl. 70, fig. 69. "Differs from *everetti* in being larger and having no basal color-bands; body-color of a light yellowish-brown. Like *versicolor* in size and form, but distinguished from that species by its dark-colored lip and its narrow reddish-brown sutural band." (*A. everetti* var. *connectens* Fulton, t. c., p. 87, pl. 5, f. 17.) *North Borneo.*

A Bornean specimen before me (pl. 66, fig. 46) agrees with *connectens* in the dark lip and red-brown sutural band, but retains narrow traces of yellow stripes on the yellowish-umber last whorl, and

has a couple of yellow bands on the base. It is merely a somewhat less developed pattern of the same form. I doubt whether *connectens* has any direct connection with *everetti*, of which Fulton makes it a variety, but think it holds a relation to *A. pictus* parallel to the relation between *dubius* and *everetti*.

Form from Sumatra, *probably referable to A. sumatranus.* A single specimen collected at Singkarah by Dr. Max Weber "agrees best with my var. B. from Mandhor [see above]. It shows quite distinctly the pale uninterrupted greenish gray stripes on all the whorls, but no spots and no specially colored sutural band; on the base of the last whorl there is only one narrow dark-brown band, which stops a half whorl short of the aperture. The immediate vicinity of the perforation shows the characteristic dark rose-red color well developed, and the interior of the aperture is light. It cannot well be doubted that this specimen belongs to *A. adamsi* and not to *A. sumatranus*, which has the same smooth, glossy shell with very superficial sutures, but only quite slight traces of stripes, and regular spots at the periphery," etc. (*Martens*, in Max Weber's Zool. Ergebnisse einer Reise in Niederländisch Ost-Indien, ii, p. 241. *Wiegmann*, op. cit., iii, p. 191–204, pl. 14, f. 1–19; pl. 15, f. 1, anatomy of same.)

Mr. C. Bock collected specimens at Sidjoendjoeng, Paio, etc., in the Padang district of Sumatra, which he refers to *A. adamsi*, without giving any information on their characters (P. Z. S., 1881, p. 630).

A. lindstedti (Pfeiffer). Pl. 70, figs. 70, 71.

Shell sinistral, imperforate, ovate-conic, solid, striatulate, glossy, white [see below]. Spire long-conic, the apex rather obtuse. Whorls $6\frac{1}{2}$, a little convex, the last about three-sevenths the total length, obsoletely angulated, the base rounded. Columella subvertical, slightly twisted. Aperture oblique, somewhat semi circular, the peristome slightly thickened, expanded, margins joined by a callus of the same color. Length 59, diam. above aperture 17 mill. (*Pfr.*) *Balabac Island* (Everett).

Bulimus lindstedti Pfr., P. Z. S., 1856, p. 388; Monogr. iv, p. 374; vi, p. 20.—*A. lindstedti* Fulton, op. cit. p. 85, pl. 5, f. 15, 15*a* (1896).

"The type specimen of this species is in a bleached state; when

in good condition it is yellow at lower whorls, fading to white above; sometimes the lower whorls are ornamented with oblique narrow pale green stripes, with a narrow orange band at the suture" (*Fulton*).

The locality given by Pfeiffer is "Malacca (F. W. Lindstedt);" but if Fulton's identification of the species from Balabac Island is correct, the original locality must have been mistaken. It has not been confirmed by any later collector. I have not seen the species, which may probably not prove specifically separable from *A. quadrasi*.

A. QUADRASI Hidalgo. Pl. 71, figs. 72–78.

Shell sinistral, imperforate, oblong-conic, somewhat solid, rather glossy and striatulate. $2\frac{1}{2}$ later whorls yellow, *densely covered with green lines and streaks*, with a *carmine border below the suture and patch encircling the columella*, both usually bordered with clear yellow; the upper whorls and apex white or faintly pink tinted, *immaculate*. Aperture oblique, white within; peristome expanded, white; columella lilac tinted or white; parietal callus thin and transparent.

Length 35, diam. above aperture 15 mill. (type, fig. 77).

Length $33\frac{1}{2}$, diam. 17 mill. (fig. 78).

Islet Candaramanes near Balabac (Quadras) and *Balabac I.* (Everett).

A. quadrasi HIDALGO, Journ. de Conchyl. 1887, p. 36, pl. 2, f. 2; 1888, p. 33; Obras Malacológicas, pl. 101, f. 5, 6 (1900).—SMITH, Ann. Mag. N. H. (6), xi, 1893, p. 350, pl. 18, f. 10 (typical form), 11–13 (varieties).—FULTON, Ann. Mag. 1896, p. 85; with var. *solida*, p. 86, pl. 5, f. 16.—*A. versicolor* Fulton, tom. cit. p. 86. —*A. dubius* FULTON, t. c., p. 86, pl. 6, f. 1, 1 *a*.—HIDALGO, Obras, pl. 101, f. 7, 8.—*A. everetti* FULTON, t. c., p. 87.—*A. contrarius* Müll., HIDALGO, Journ. de Conchyl. 1888, p. 34.

Close to certain Bornean forms of *A. adamsi* from which it may be distinguished chiefly by the different color-patterns, green lines on a yellow ground, with red at the suture and columella being especially characteristic of the typical *A. quadrasi*.

Mr. E. A. Smith described a number of color variations from Balabac Island, his specimens having been collected by Alfred Everett. Mr. Fulton has given a part of these specific rank; but having before me specimens received from Fulton, as well as a quantity collected some years ago by Mr. J. B. Steere, I find that the

latter shells connect the supposed species in every direction. Selected specimens may be classified according to Mr. Fulton's arrangement, but the intermediate forms repudiate it as unnatural. My plates were arranged before the forms were completely studied, and so do not show the connections as well as might be desired; but as an instance of the color-form chains occurring, I would mention one connecting *quadrasi* and *versicolor* through pl. 71, fig. 78; f. 75, pl. 66, f. 47, f. 43, pl. 71, f. 91; or from pl. 66, f. 47, we may pass to pl. 71, f. 89. And the immature shells of this last form are exactly like some *dubius*, in stripe and band marking. The latter form (*dubius*) also connects directly with the maculate form of *quadrasi* (pl. 71, f. 74, 75) through several specimens before me.

Color-form *solidus* Fulton. Pl. 71, fig. 76. "Smaller and more solid than typical *quadrasi*, subangulate at the periphery; last whorl either white, reddish-brown or yellow, with a broad white spiral band just below the suture; upper whorls either plain white or with narrow, oblique, interrupted, light brown stripes" (*Fulton*).

Palawan.

Fig. 76 is Fulton's type.

Specimens before me (pl. 71, figs. 72, 73, 74, 75; pl. 66, figs. 47, 48), have the last whorl yellow except for a broad white belt below the suture, with close blue-green lines or scarcely any, the suture with a yellow or red margin or none; the spire whitish with purplish flames forked above, or cut by a median whitish line into two series of purplish spots, the upper series split or forked, apex with a small dark dot; the columella with a small reddish area or none. Sometimes the purplish maculation of the early whorls extends upon the last; and in most of the shells the parietal wall shows a basal spiral band visible on looking into the aperture, but not reaching the last whorl. The specimens figured are from Balabac. This series forms a practically complete transition to *versicolor* and *dubius*.

Color-form *versicolor* Fulton. Pl. 71, figs. 84–91. Variable in form from oblong- to ovate-conic, imperforate. Apex usually with a blackish dot, the spire either plain whitish or fleshy or striped with brown flames forked or dissected above; the last whorl either (fig. 87) cream-buff, the tint deeper below, or (fig. 86) yellow, suffused toward base and suture with carmine, and with some greenish spiral lines, the lip pink, columella red-purple, or (figs. 90, 91) buff with wedge-shaped dark green bands behind the lip, or (figs. 88, 89)

streaked with reddish-brown except for a pale belt below the suture, and with a greenish belt below the periphery, or (fig. 85) pale yellow with faint green oblique lineation, interrupted at periphery. Aperture and lip white except in the red stained form; the columella and its vicinity either white or pink-tinted. Length 47, diam. 20. Length 43, diam. 22. Length 38, diam. 18. Length 35, diam. 18–19. Length 33, diam. 16½. Length 24½, diam. 14 mill.

Balabac Island.

In a series of four specimens from Fulton, collected by Everett, and six collected by Steere, no two are alike in markings or size. The smallest specimen before me is figured, pl. 66, fig. 42. It has 5½ whorls and a peripheral brown band. The largest shells have fully 7 whorls. Steere collected green-lineate specimens with and without a red sutural line connecting with the typical *quadrasi*.

Color-form *dubius* Fulton. Pl. 71, figs. 79–83. Ground-color yellow below, whitish on the spire, copiously striped above the periphery with bluish gray, becoming brown on the spire, the stripes continuous or branching above; the base with a band below the periphery and usually another midway, the columellar region pale or stained with red; suture with a pale or a red margin. Aperture usually dark within, the lip white, columella white or pink. Sometimes the stripes coalesce to a uniform bluish band over the whole upper surface of the last whorl. Dimensions variable.

Balabac Island.

Figures 79, 80 are Fulton's types, figs. 81–83 other specimens collected by Steere. The periphery may be subangular or as rounded as in *quadrasi*, indifferently. It is distinguished from *A. adamsi pictus* by the locality; from *A. everetti* by the white lip.

Color-form *everetti* Fulton. Pl. 70, figs. 65, 66, 67, 68. Yellow, fading to white on the earlier whorls, the apex black, copiously striped with purple-brown on the spire, olive on the last whorl, the stripes simple or branching above; the base with two wide blackish-olive girdles and a reddish columellar area. Suture with either a pale or red border. Aperture dark within; *lip blackish-brown*, expanded. Length 40, diam. 18–20. Length 30, diam. 16 mill.

Palawan.

19. *Group of A. sinistralis.*

Elongate forms with convex whorls and rather dull coloring, characteristic of northern Celebes.

A. SINISTRALIS (Reeve). Pl. 68, figs. 23–31.

Shell sinistral, umbilicate, long-conic, rather slender, moderately solid, glossy, usually fleshy buff or yellow, fading to whitish on the spire, *marbled or dotted with translucent-gray*, and often more or less streaked obliquely with gray or pinkish gray. Slightly striatulate and obsoletely striate spirally. *Spire long and straightly conic*, the apex obtuse. Whorls $6\frac{1}{2}$ to 7, convex. Aperture small, oblique, white, yellow or brownish inside; peristome white, expanded, the columellar margin triangularly dilated above, the edge *thickened at the insertion* above the umbilicus.

Alt. 37, diam. 18, longest axis of aperture $16\frac{1}{2}$ mill.

Alt. 39, diam. 16, longest axis of aperture $15\frac{1}{2}$ mill.

Celebes: *northern peninsula from Paguat westward.*

Bulimus sinistralis REEVE, Conch. Icon. pl. 81, f. 603 (December, 1849).—PFR., Conchyl. Cab., p. 137, pl. 41, f. 11–13; Monogr. iii, p. 321; iv, 382; vi, 23.—MARTENS, Ostas Landschn., p. 355, pl. 21, f. 2*a*, *b*, *c*, 11; Malak. Bl., xx, 1872, p. 173.—TAPPARONE-CANEFRI, Ann. Mus. Civ. Stor. Nat. di Genova, xx, 1884, p. 147 (with var. *decolor*); 169.—*Helix læva* QUOY & GAIMARD, Zool. Astrolabe, ii, p. 120, pl. 10, f. 4 (living).—*Bulimus lævis* DESH. in Fér. Hist., pl. 161, f. 11, 14–18.—*Amphidromus sinistralis* WALLACE, P. Z. S., 1865, p. 412.—SEMPER, Reisen im Archip. Phil., iii, p. 146, pl. 16, f. 22 (teeth).—BOETTGER, Bericht Senckenb. Nat. Ges., 1891, p. 269.—FULTON, Ann. Mag. N. H. (6), xvii, p. 76, with vars. *rosea* and *lutea*.—KOBELT, Abhandl. Senckenb. Naturforsch. Gesellschaft, xxiv, p. 79, 80, pl. 7, f. 8, 8.—P. & F. SARASIN, Die Land-Mollusken von Celebes, p. 212, pl. 31, f. 303 (teeth), 1899.

The translucent-grayish dots, blotches or streaks on a pale yellow or pinkish ground are characteristic, though a wide range of coloring obtains. Reeve's type (pl. 68, fig. 23) was decidedly streaked. It has been reported from Java, Timor and the Moluccas, but no doubt erroneously.

Sarasins give the following localities and color-forms: *Menado:* yellow with reddish apex and sparse translucent flecks; yellow, with dark greenish streaks. *Kema;* yellow or reddish, with numerous dark flecks, the origin of which by dissolution of streaks is shown by a few shells. *Tomohon;* uniform yellow, reddish, yellow with a lighter spiral band upon the last whorl, or upon the others, with

flecks, or dark-streaked. *Limbotto Lake;* two yellow specimens, alt. 40½ and 34 mill., one with dark streaks. *Coast of Paguat*, west of Gorontalo; small, alt. 32 and 29 mill., uniform reddish.

Var. *fasciata* Sarasin (pl. 68, fig. 26). *Gorontalo.* "Last whorl very richly banded with chestnut brown, yellow, reddish and clear green, the penultimate with two bands, passing into streaks above; peristome bluish, a dark margin behind it, passing into the chestnut brown umbilical band; alt. 33, diam. 14½ mill. A similar shell is described by Kobelt from Minahassa (fig. 27, 28), this having the last half whorl streaked, the rest of the shell banded, peristome dark as in our specimen." It occurred among other forms of *sinistralis*.

Tapparone-Canefri proposes the name var. *decolor* for a yellowish white shell with transparent spots above. Fulton distinguishes a var. *rosea*, "the same form as *sinistralis*, but of a pale rose-color, and without the dark color inside aperture," and var. *lutea*, "a fawn colored variety with white interior." He credits the names of these varieties to von Martens, who however did not name them, but merely distinguished them by the letters C and B respectively. In view of the wide range of individual variation in color demonstrated by the Sarasins, the utility of naming these mutations is questionable. Figs. 24, 25 represent a specimen received from Mr. Fulton as var. *rosea;* fig. 30 as var. *lutea*.

P. bataviæ Grateloup. (Pl. 65, fig. 34.) Shell reversed, ovate-ventricose, imperforate, smooth, glossy, chestnut, obliquely banded. Aperture subovate, the lip whitish, reflexed. Columella twisted inward (*intorta*).

Partula bataviæ Grat., Actes Soc. Linn. Bordeaux, xi, p. 425 (39 of separate copies), pl. 2, f. 12 (1840).—*Bulimus bataviæ* Pfr., Monogr., ii, p. 40.

Said to be decidedly lighter colored than *Partula otaheitana* Fér., and ornamented with slightly oblique, longitudinal tawny flames, the columella nearly straight and short, whorls 6. Alt. 30, diam. 18 mill. Said to be from Batavia, Java; but as many of the localities given by Grateloup in the same paper are glaringly false, no great dependence is to be placed upon this.

A. kruijti P. & F. Sarasin. Pl. 68, figs. 18, 19, 20.

Shell large, always sinistral, narrowly conic, with round, half-covered umbilicus, solid. Whorls 7½, convex, separated by deep

sutures, sometimes somewhat angular near the suture, with a narrow impressed margin, the last whorl comparatively short. Aperture less than half the shell's length, vertical, long-oval, the lip thin but broadly reflexed like the mouth of a trumpet, white, with a thin parietal callus; the basal margin forming an angle with the columellar margin, the latter triangularly dilated above. The sculpture consists of growth-lines crossed by very closely-crowded, fine spiral lines. Color either uniform yellowish white, the interior yellow, or secondly, uniform pale greenish-yellow, with a few translucent dark dots (as in *A. sinistralis*), or thirdly, reddish-white, with darker streaks, also reddish, and a few translucent dark spots. (*Sarasins.*)

Length 53.5, diam. above aperture 21, height of aperture 24.5 mill.

Length 44, diam. above aperture 20, height of aperture 22 mill.

Celebes, northern and north-central, at *Karoa; Mintinang chain*, 500–1500 meters; *Buol; northern shore of Posso Lake.*

A. kruijti P. & F. Sarasin, Die Land-Mollusken von Celebes, p. 213, pl. 26, f. 263, 263*a*, 264 (shell), and pl. 31, f. 304 (radula). 1899.

Resembles the smaller *A. sinistralis* Rve., also from northern Celebes. Figs. 18, 19 from a Buol specimen; fig. 20 from Karoa.

Spurious and Undefined Species.

Bulimus (*A.*) *cosmandanus* Crosse, Pætel's Catalog, Edit. 4, p. 210 = *Helicostyla cossmanniana* Crosse.

B. (*A.*) *crichtoni* Brod., ibid. = *Drymæus.*

B. (*A.*) *imbricatus* Gass., t. c., p. 212 = *Placostylus imbricatus.*

B. (*A.*) *rhombostomus* Pfr., t. c., p. 216 = *Buliminus.*

B. (*A.*) *tenellum* Dall, t. c., p. 218 = *Buccinum.*

B. (*A.*) *trifasciatus* Ch., t. c., p. 218 = *Beddomea,* see vol. XIV.

Bulimus quagga van Hasselt, Algemeene Konst en letterbode, 1823, p. 233 (see Férussac's Bull. des Sci. Nat. iii, 1824, p. 83), is a nude name applied to a Javan species of *Amphidromus.*

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Bothriembryon.

B. physodes (Menke). Page 9.

Mr. Charles Hedley has called my attention to the fact that the above name was published by Menke in 1848, and therefore will re-

place Reeve's name *physoides*. Being buried in the text under *B. melo*, I overlooked the name when consulting Menke's work.

Menke considered *physodes* one of four varieties of *melo*, which he collected and defined; giving the following description:

"*a.* Testa ovato-elliptica, rufa, in anfractu infimo vitta una vel altera albida vel fusca, basi fascia nigra, huic fascia albida superius adnata picta, spira mediocri. Long 9, lat 5 lin.—Bulimus physodes, m. olim, in lit." (Molluscorum Novae Hollandiae Specimen, p. 7.)

Menke's var. *b.* was probably typical *melo; c.* and *d.* may have been *inflatus*. All were collected in October, 1840, in the Hay district.

Placostylus.

P. shongii (Lcss.). Page 22.

I am informed by Mr. H. Suter that this name is incorrect, and should stand *hongii*, as the chief for whom the species was called, was named *Hongi*, not "*Shongi.*" This information is valuable and interesting from an historical standpoint; but even those who cannot endure halting Greek in nomenclature, would probably not insist upon elegant and correct Maori, when it involves the alteration of a specific name.

P. fibratus (Martyn). P. 39.

The type locality of the original *P. fibratus* has been unknown, and as its discovery is of importance in connection with the study of the distribution of the varieties, I quote the following interesting extract from a letter received from Charles Hedley:

"It may be worth mentioning what has escaped the notice of Crosse and everybody else, that we can recover the exact original locality of *P. fibratus*. At the time of Martyn's *Universal Conchologist*, no Europeans except Cook's party had visited New Caledonia. Therefore it was collected by them. Cook landed twice in New Caledonia, firstly at Balade, secondly at a 'mere sandbank not exceeding three-fourths of a mile in circuit,' between the mainland and the Isle of Pines. *Vide* voyage of the Adventure and Resolution II, 1779, p. 139, map opposite p. 24. This he called Botany Island; modern French charts the Ile Amère.

Now *P. fibratus* as you remark does not occur at all in the north, and since Montrouzier lived for years at Balade itself we can confi-

dently assert that it does not exist there. So you see there is no escape from the deduction that Cook's people took it at the Ile Amère."

P. ALEXANDER var. PATULUS Kobelt. Page 35.

Differs from the type by the spreading aperture, obsolete parietal tooth, black-brown epidermis zoned with black, dull buff color of the aperture and orange throat. Alt. 100, diam. maj. 62, min. 43, oblique length of aperture 62 mill. Neighborhood of Kanala. (*Kobelt*, Conchyl. Cab., p. 115, pl. 28, f. 1.)

P. PORPHYROSTOMUS var. UMBILICATUS Kobelt.

Widely but half-covered perforate; thick and ponderous; the lip much thickened, white. Alt. 81, diam. 37, aperture with peristome 40 mill. Govuro, on the west coast of New Caledonia (Layard coll.). Kobelt states that this variety represents an abnormal condition become constant. (See Conchyl. Cab., p. 119, pl. 29, f. 5, 6.)

P. CLERYI (Recluz). Page 96. Frontispiece, figs. 7, 8.

Since the account of this species was printed, I have received from Dr. J. C. Cox a magnificent specimen retaining the cuticle on all but the earlier whorls. It is green, the last whorl streaked with darker, and with a whitish border along the suture; the penultimate whorl becoming yellowish-green with oblong olive spots, as in *P. sanchristovalensis*. Above this the cuticle is absent, and the color a lively pink. The aperture is flesh-colored within, lip reddish-brown; the columellar fold being nearly white. The spiral corrugation is well developed.

This specimen confirms the close relationship claimed to exist between *cleryi* and *sanchristovalensis* (p. 98).

P. MILTOCHEILUS ALBOLABRIS (Braz.). Page 95. Frontispiece, fig. 6.

A decollate and nearly white example was figured on plate 38. The specimen now shown, which I owe to the liberality of Dr. Cox, is decidedly yellow, has 5 whorls, of which $1\frac{1}{2}$ are punctate, and the base is but slightly saccate. Alt. 54, diam. $23\frac{1}{2}$, aperture 34 mill.

P. HARGRAVESI HEIMBURGI Kobelt. Page 93.

A specimen received from Dr. Cox is slightly stouter than Kobelt's figures. It has a thin pale buff cuticle indistinctly mottled with

dilute olive, the spire salmon-tinted above. The peristome is less expanded than in the typical form, and there is no parietal tubercle. Whorls 5½. Length 48, diam. 24, aperture 29 mill.

This is a well-marked sub-species.

P. HOBSONI Cox. Page 91. Frontispiece, figs. 9, 10.

A specimen generously sent by Dr. Cox is figured. The color is a rich chestnut-yellow, with triangular reddish-chestnut spots on the last 1½ whorls. Whorls slightly exceeding 5, convex, the earlier 2½ punctate, the last whorl a little more coarsely corrugated than *P. elobatus* or *sanchristovalensis*, the spirals but little interrupted or branching on the base. The aperture is not oblique, is slightly whitish in the throat, becoming somewhat orange-brown or golden-brown toward and upon the lip, which is slightly expanded; the luster and color of the interior being peculiarly changeable. Columella nearly white, broadly dilated, arched upward over the umbilicus. Length 51, diam. 25, aperture 33½ mill.

I think this form will be considered a variety of *P. uliginosus*, from which it may differ in not being lipped with white.

AMPHIDROMUS.

A. INVERSUS subsp. ANNAMITICUS C. & F. Page 170.

In the text I failed to give the original reference to var. *roseotincta*. Dr. von Möllendorff writes: "Near Chaya [on the east side of the Malay Peninsula] Mr. Roebelen collected a fine variety of *A. annamiticus* Cr. & Fisch. with rose-colored apex which I name var. *roseotincta*" (*Mlldff.*, P. Z. S., 1894, p. 150, under *A. moniliferus*).

A. METABLETUS Mlldff.

Dr. von Möllendorff reports a form of this species from the island Bay-min. (Nachrbl. 1900, 133).

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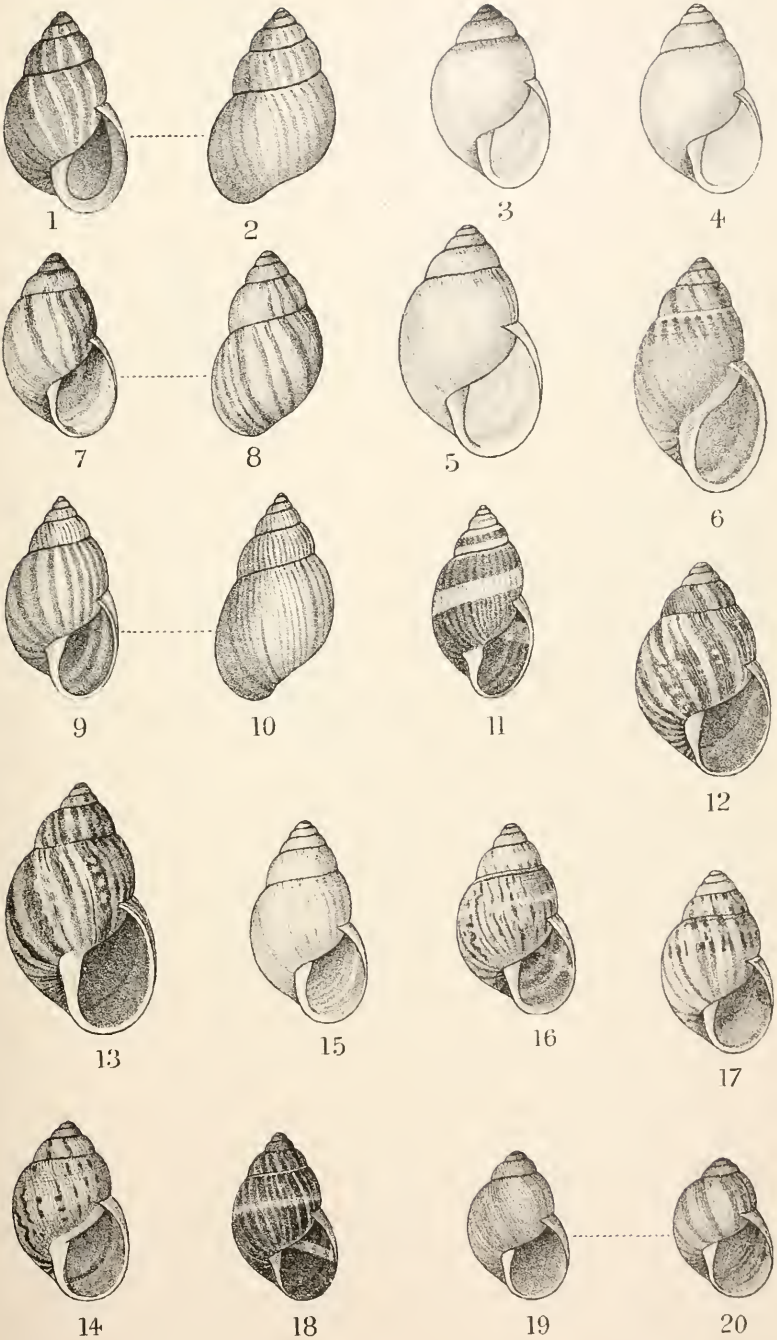
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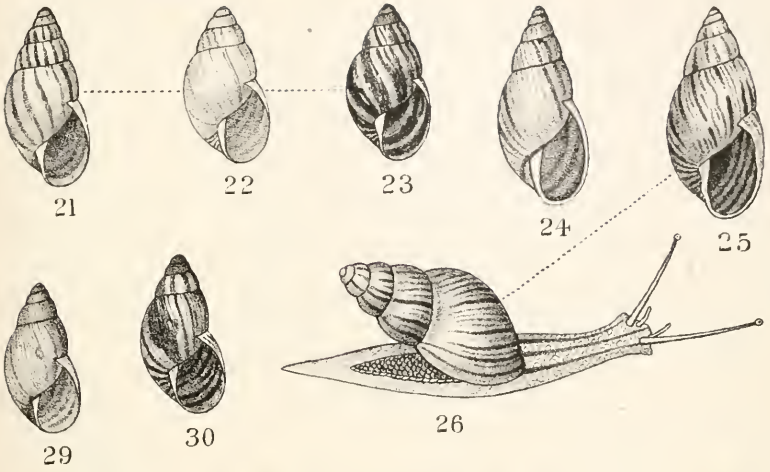
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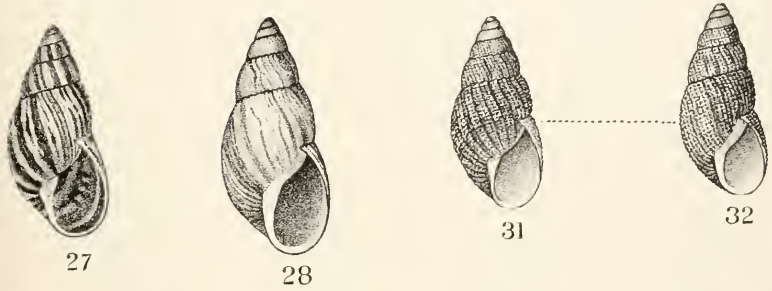
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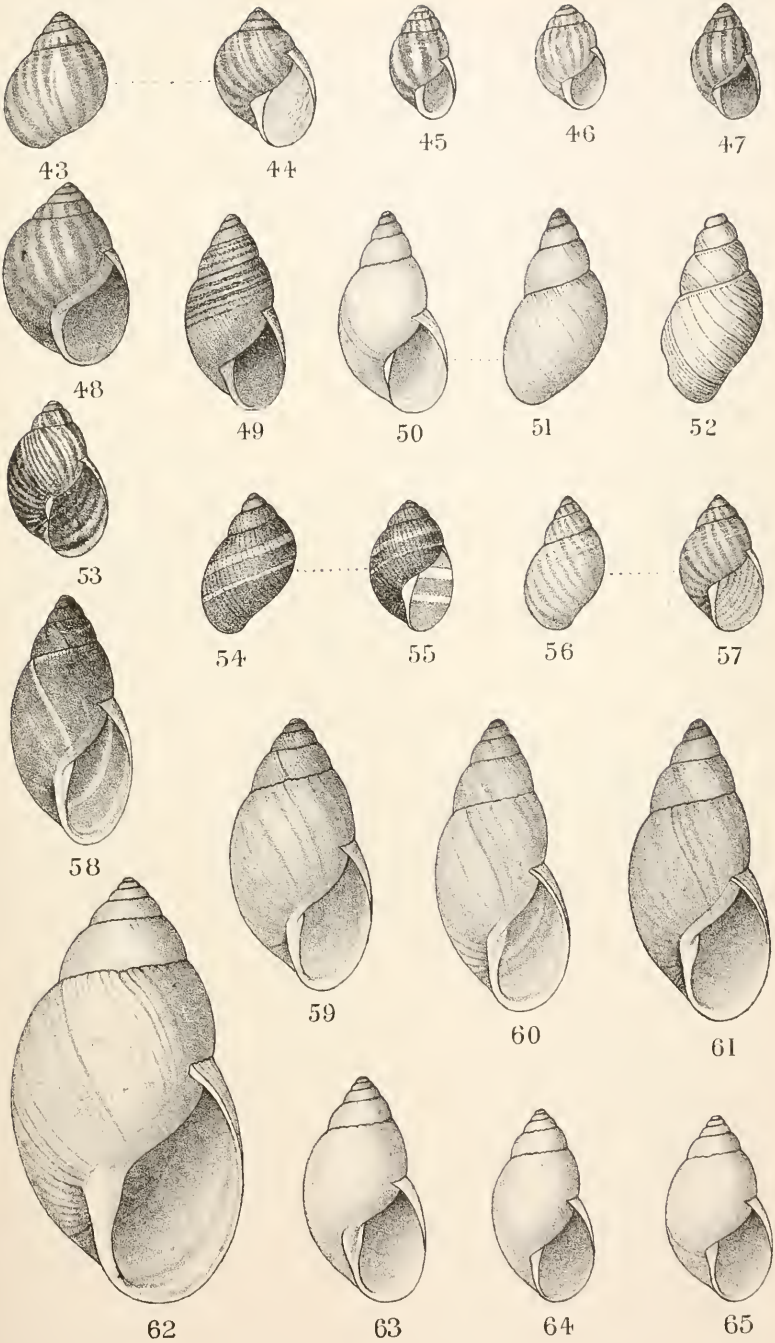
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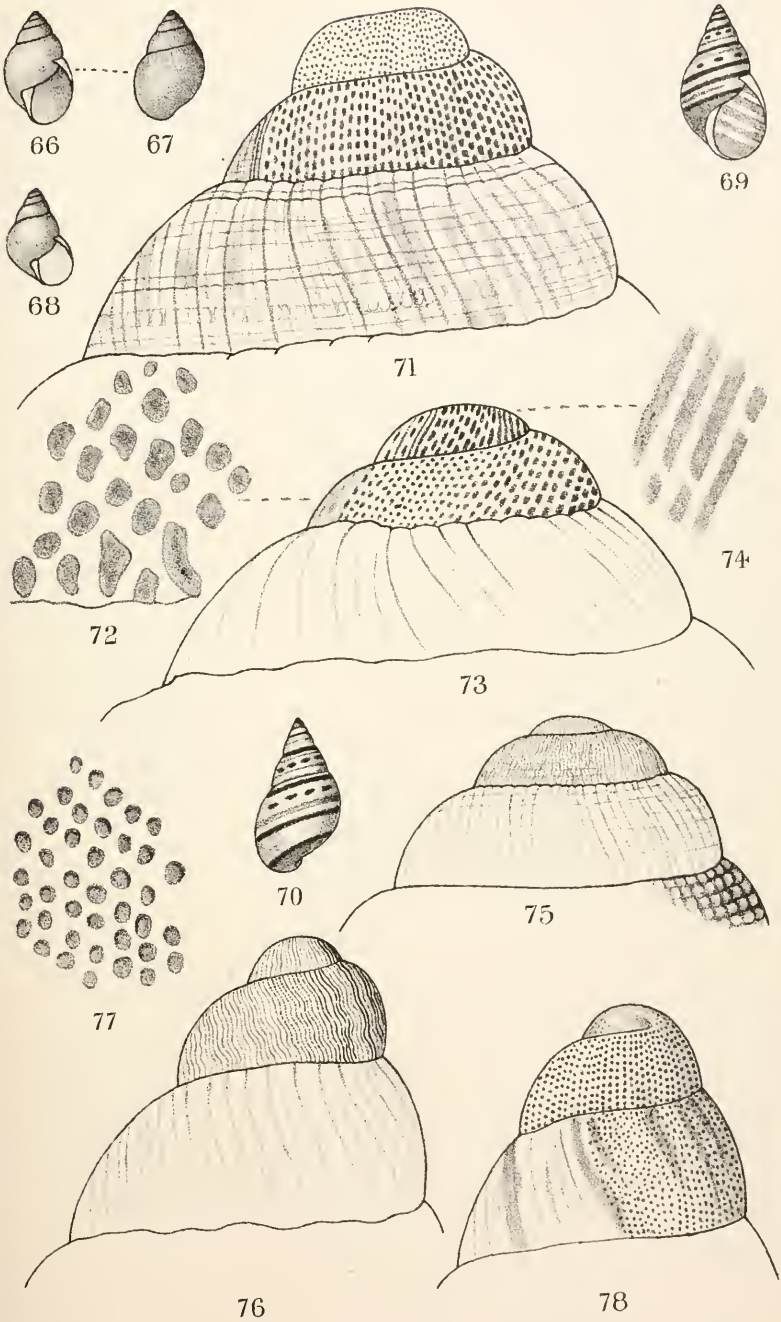
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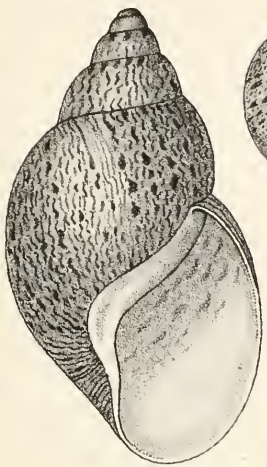

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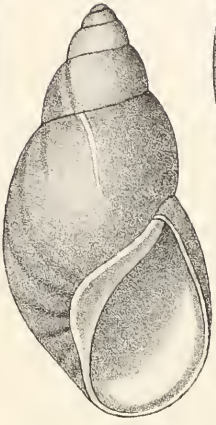

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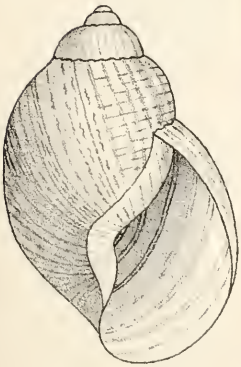

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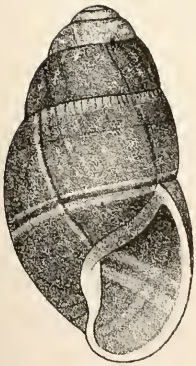

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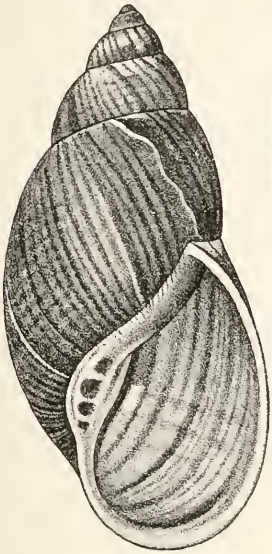

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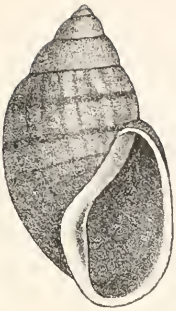

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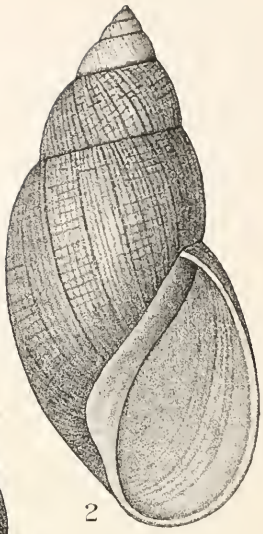

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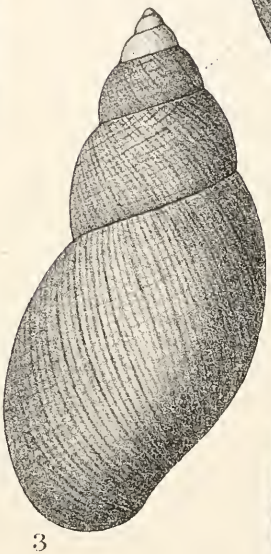

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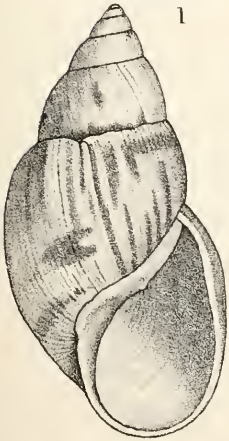

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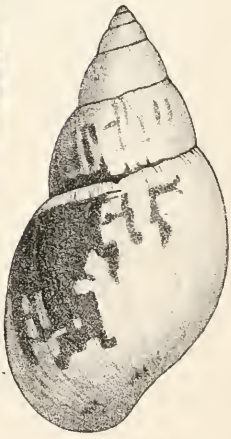

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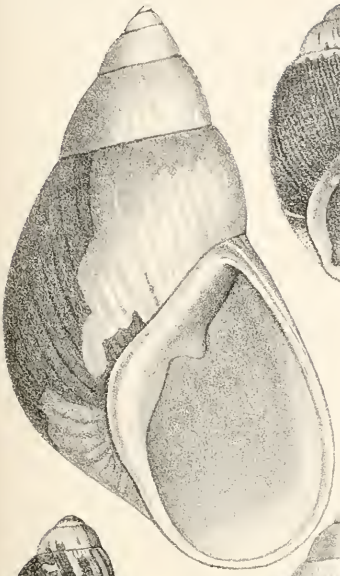

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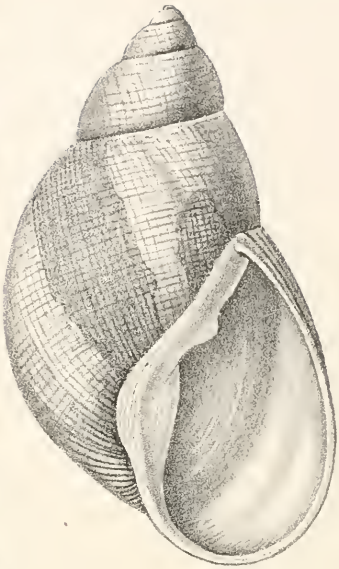

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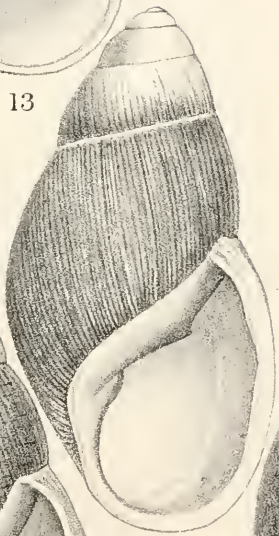

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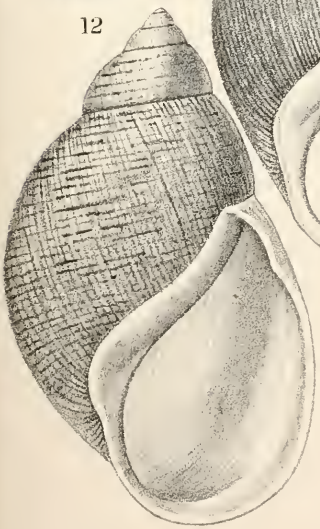

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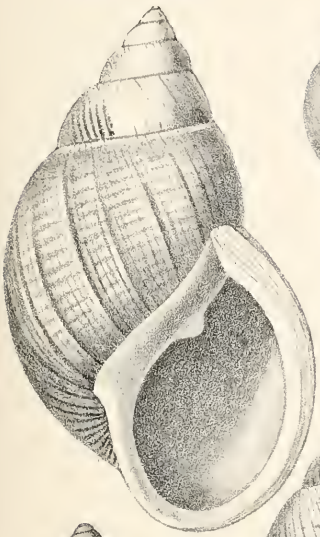

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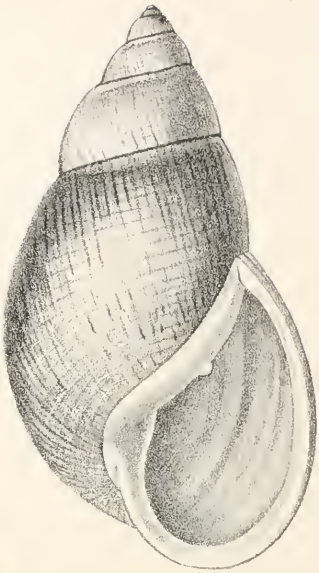

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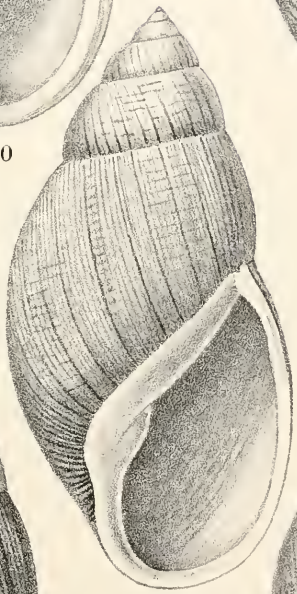

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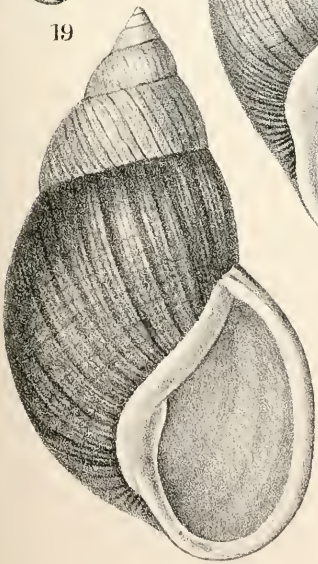

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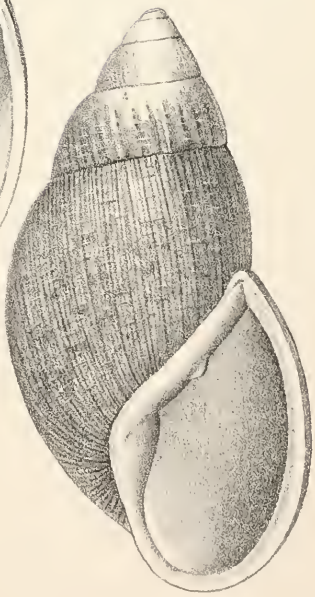

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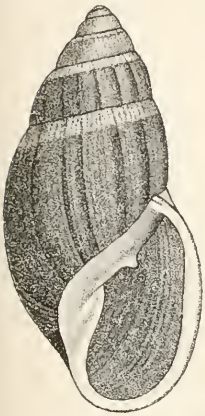

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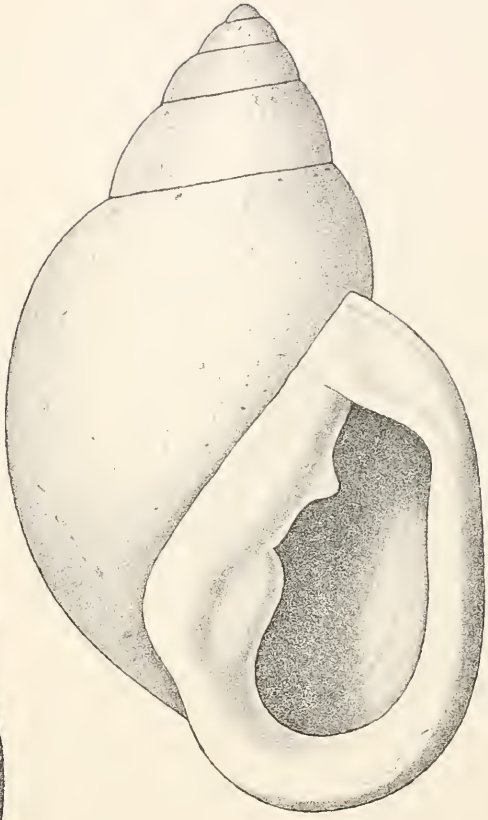

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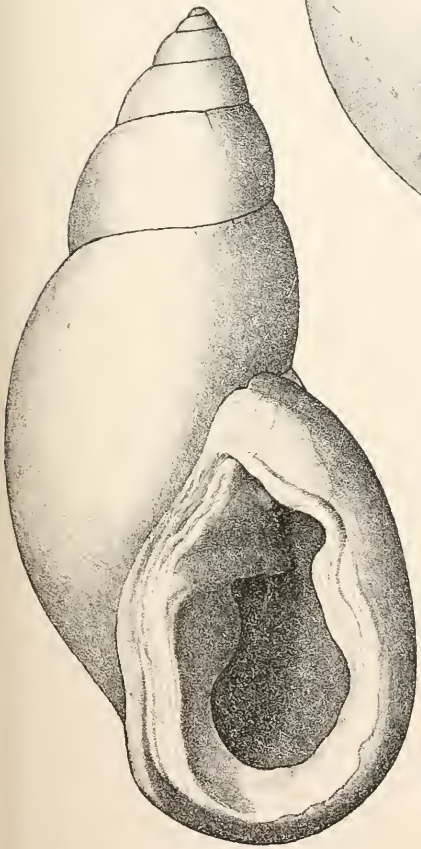

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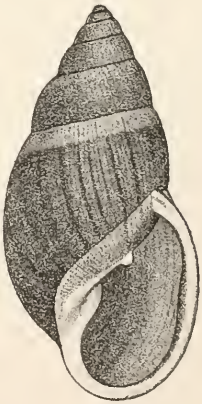

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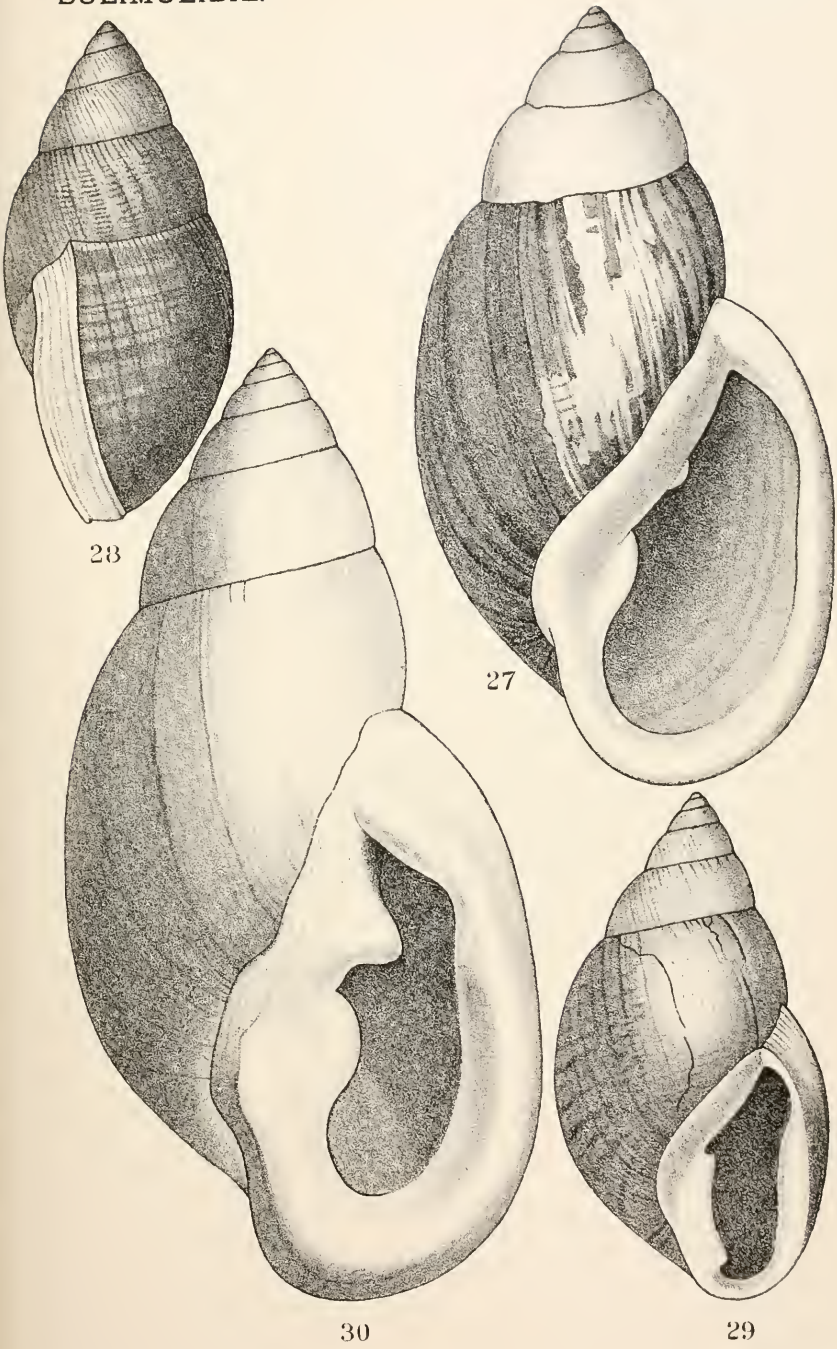
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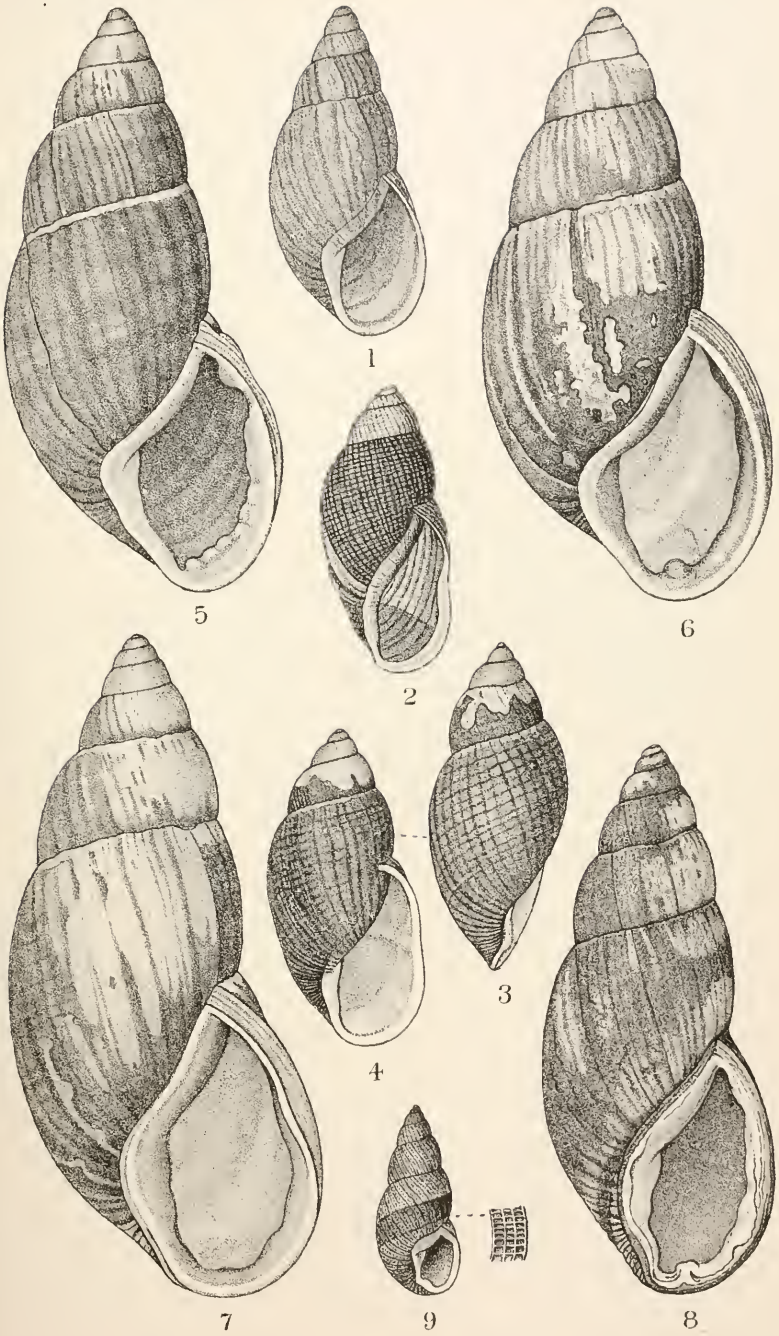

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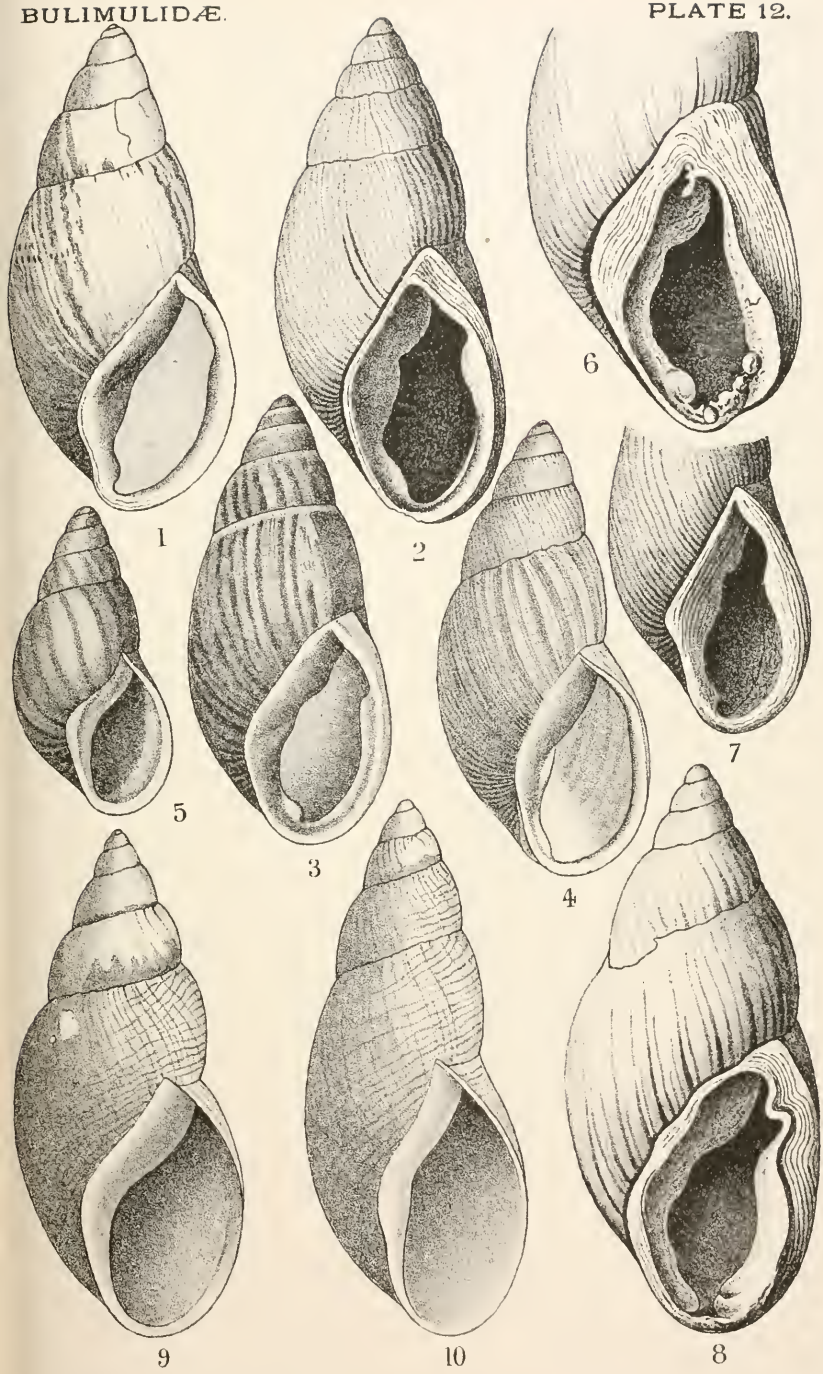
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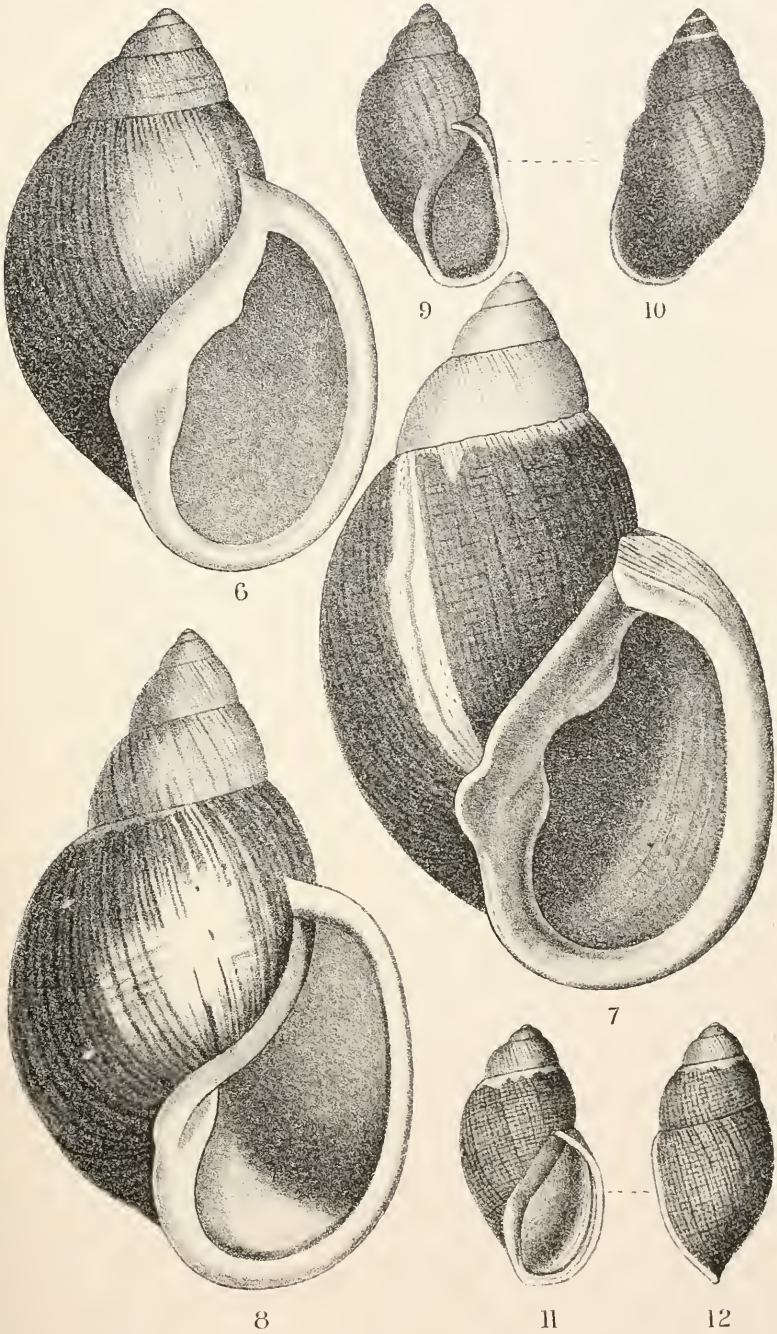
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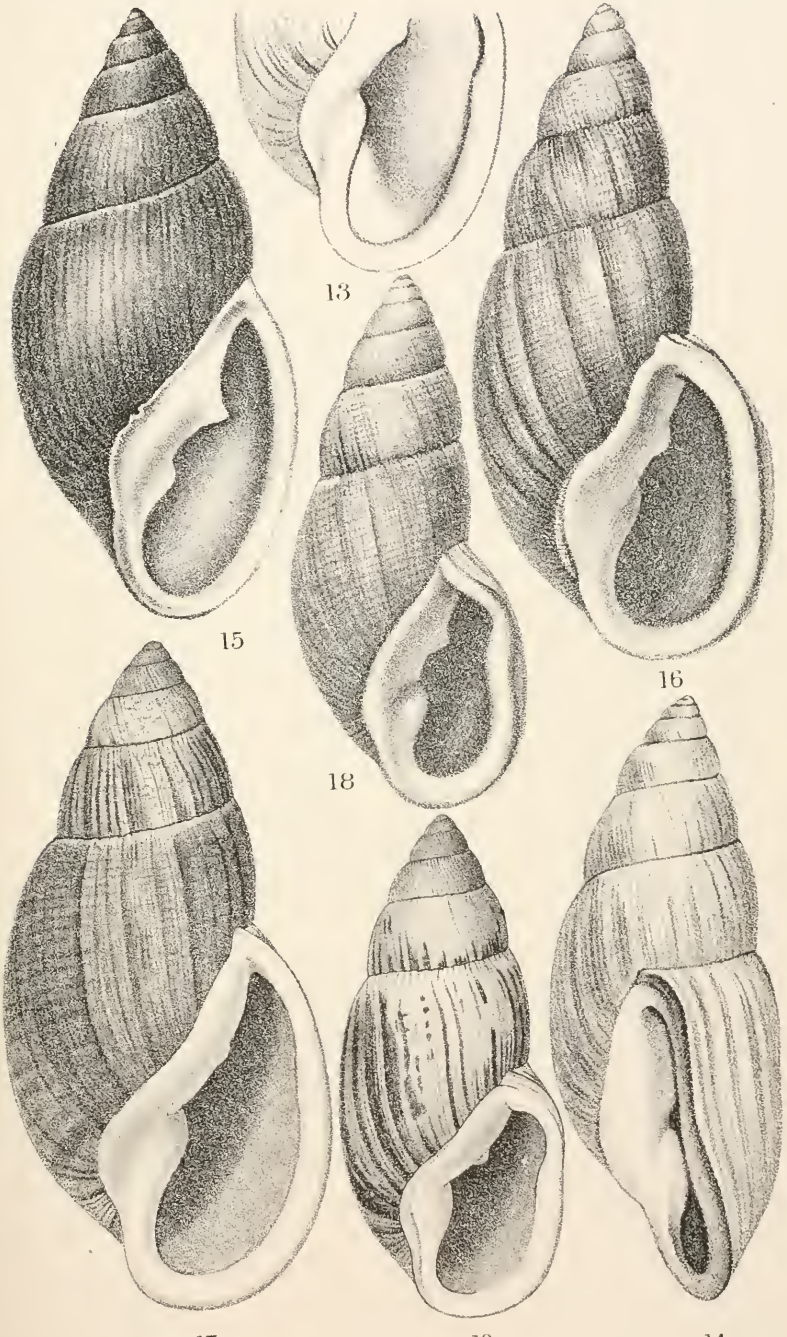
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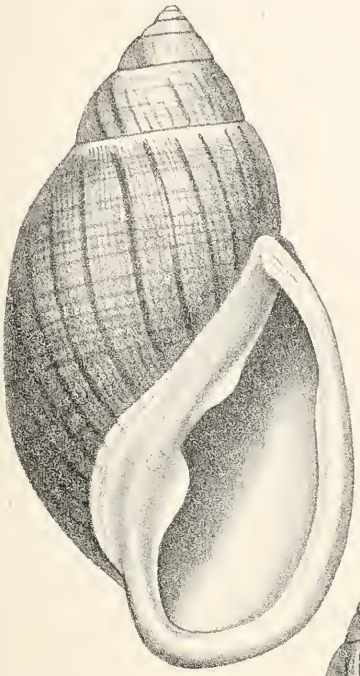

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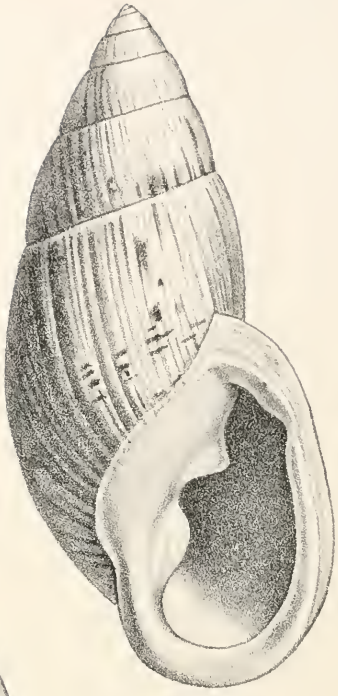

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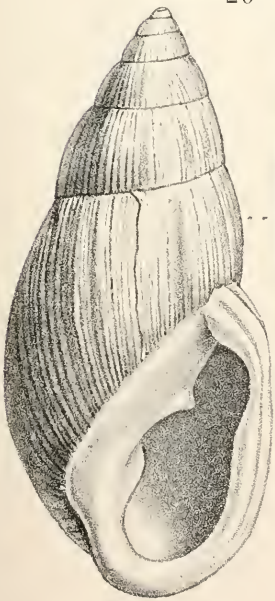

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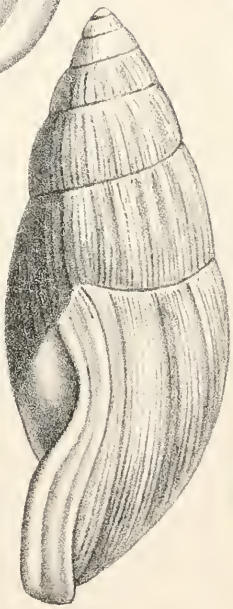

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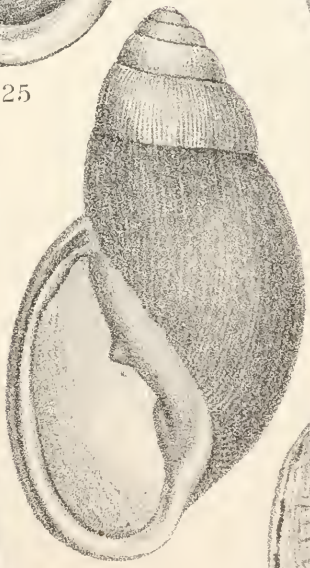

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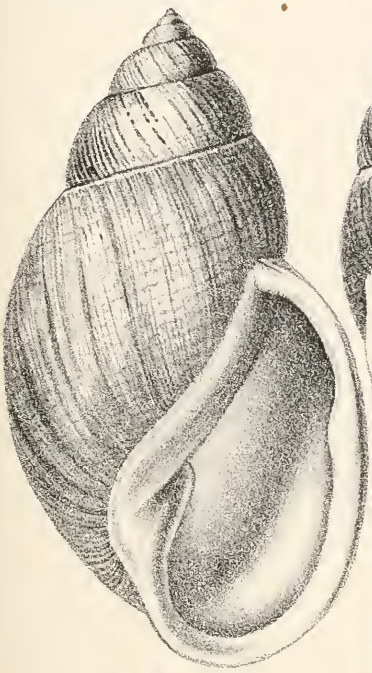

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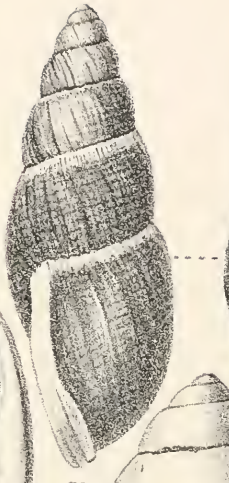

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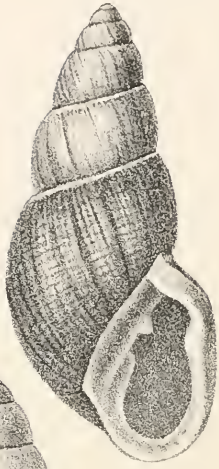

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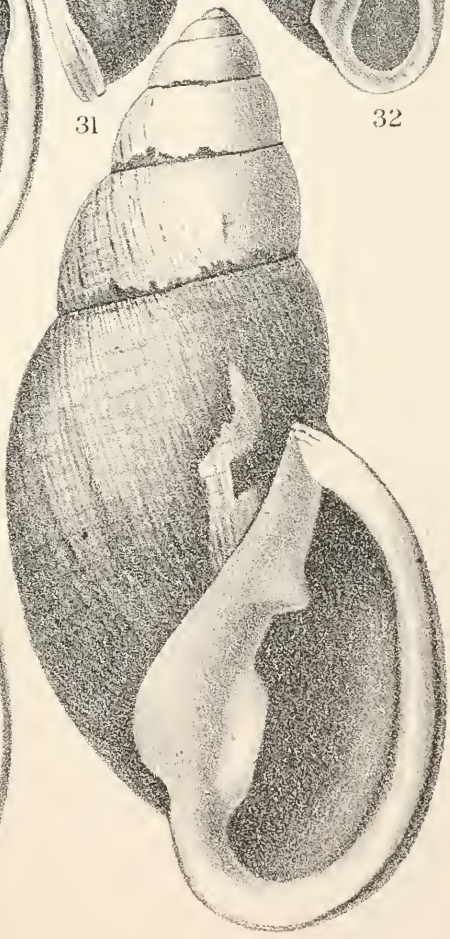

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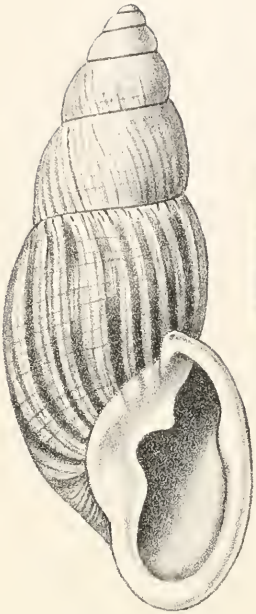

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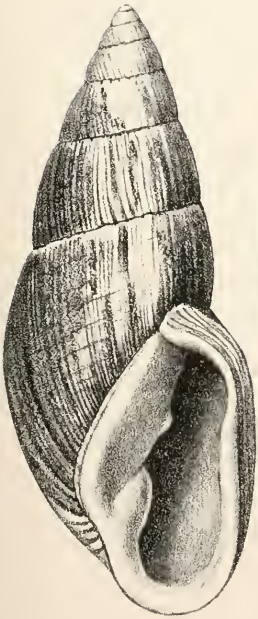

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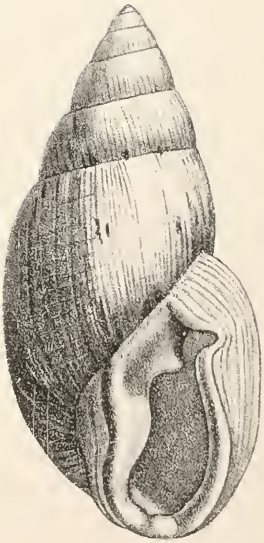

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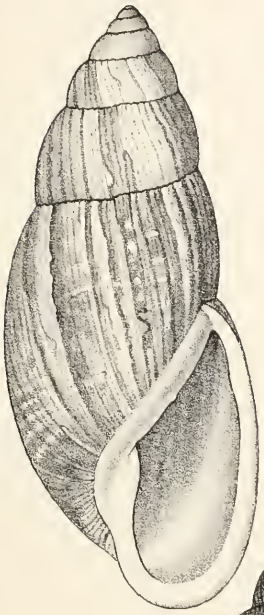

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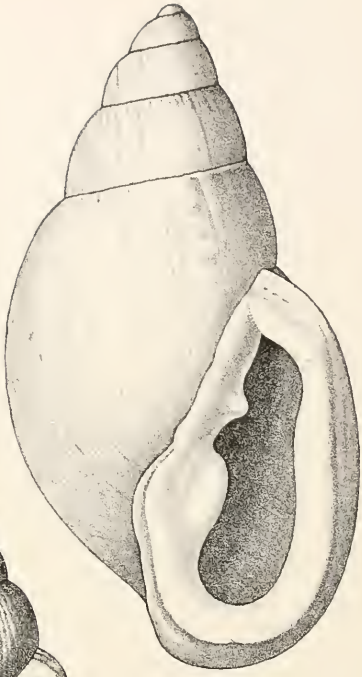

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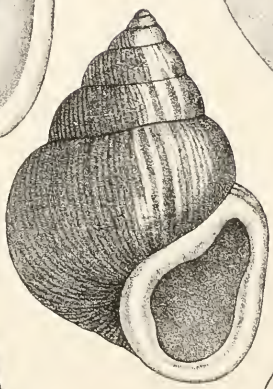

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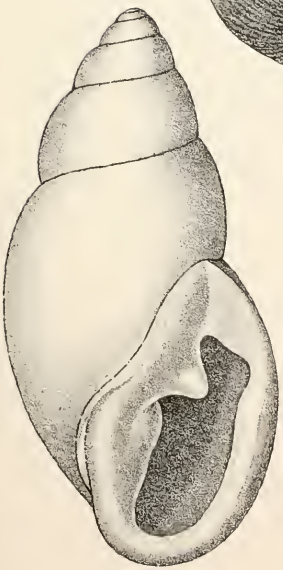

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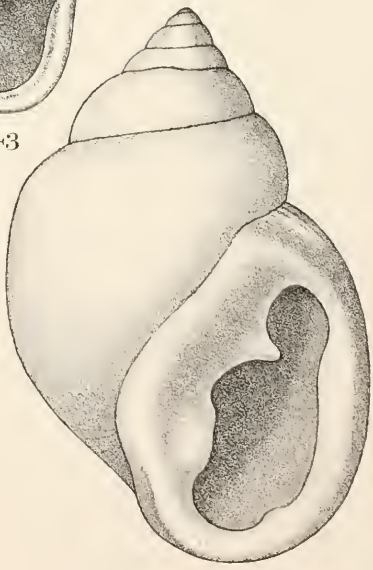

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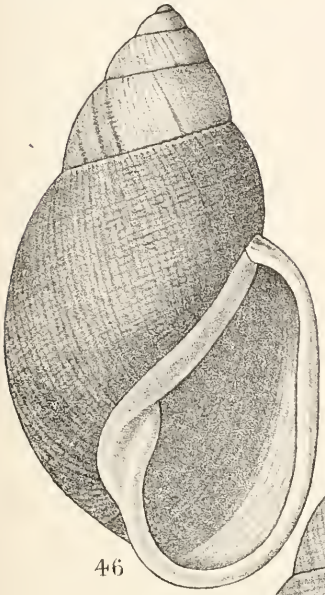

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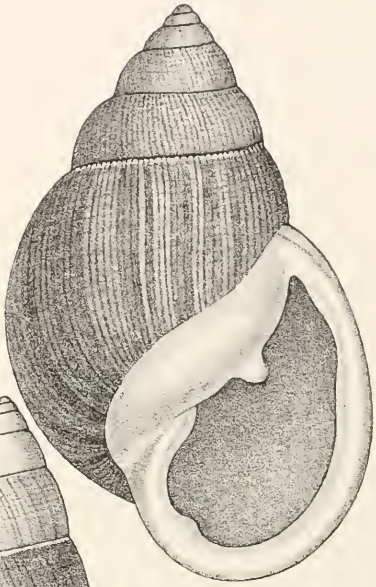

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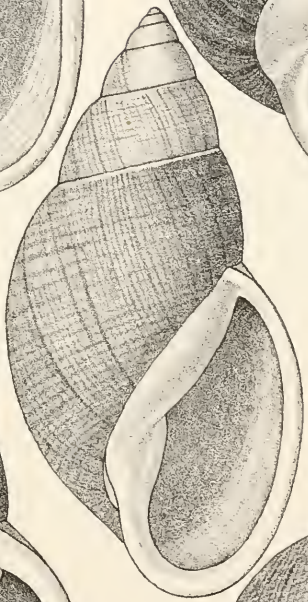

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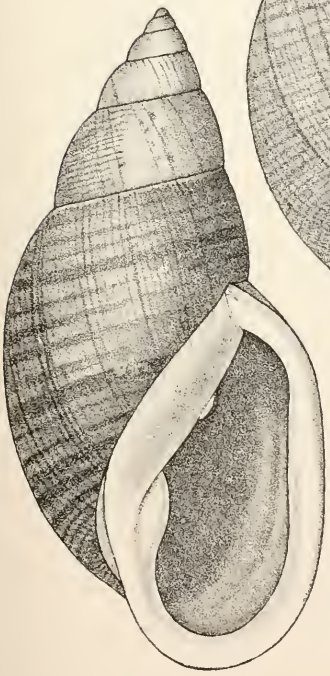

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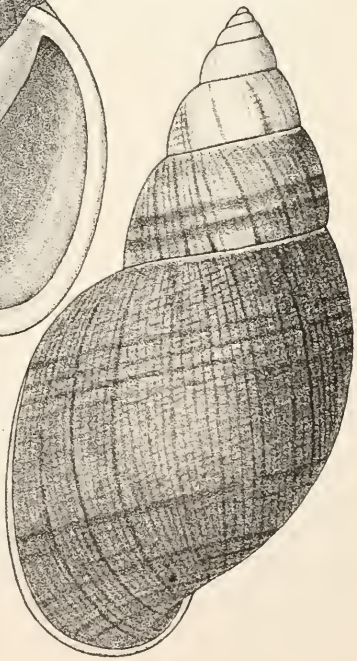

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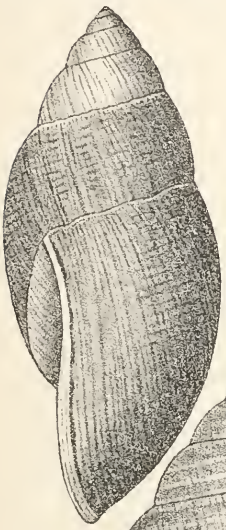

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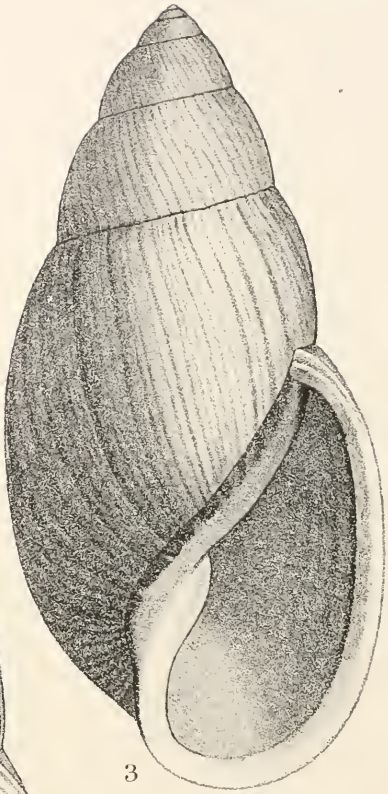

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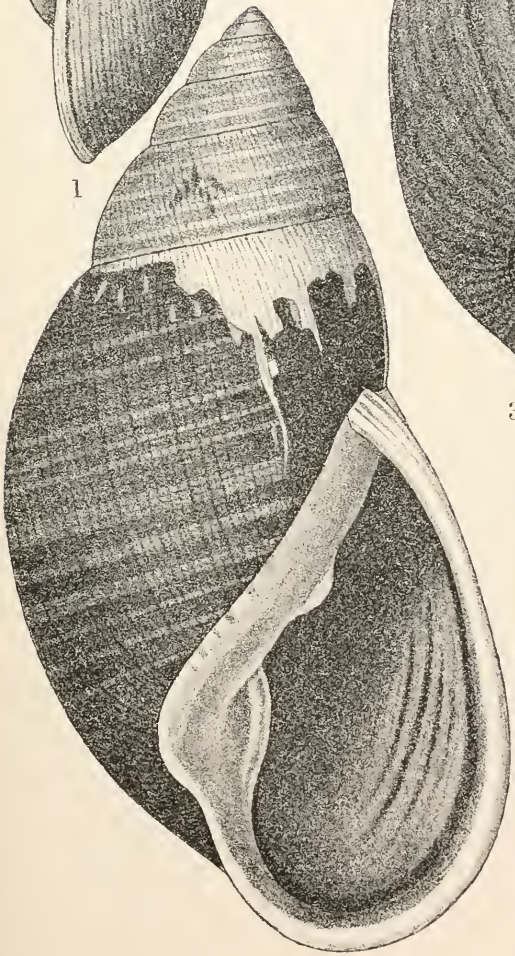

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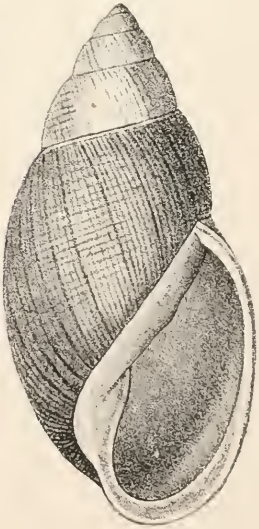

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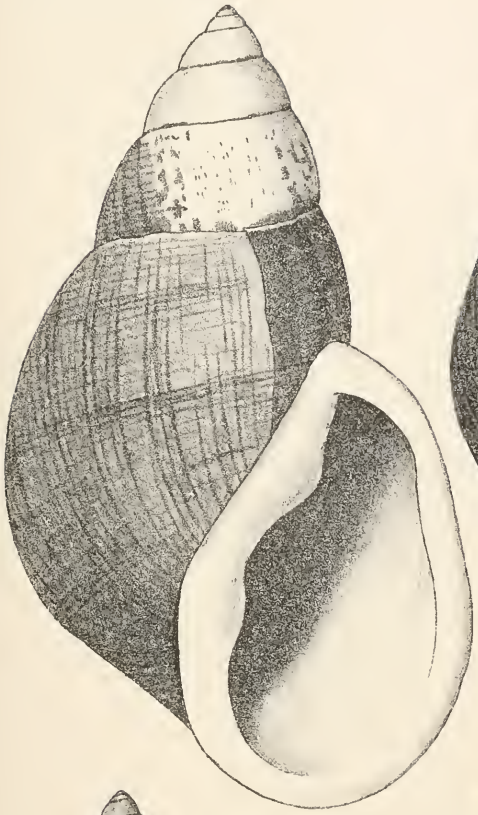

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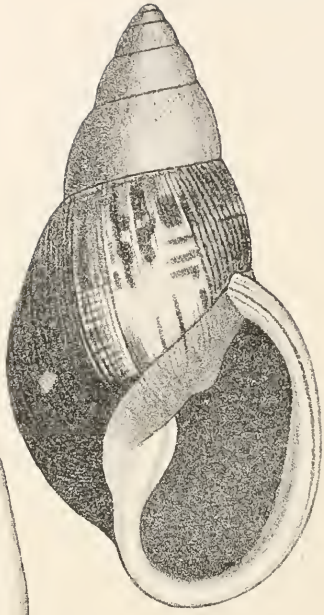

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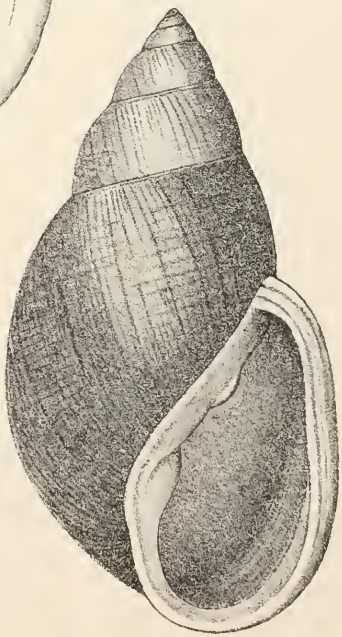

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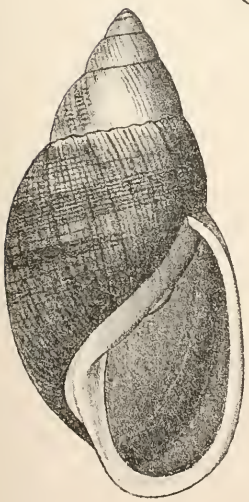

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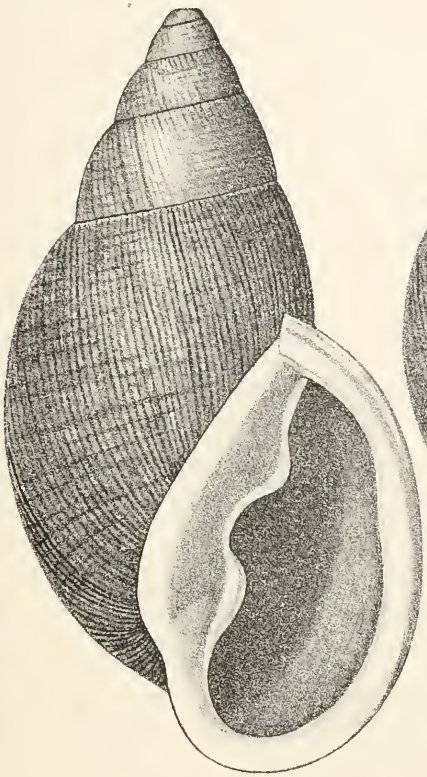

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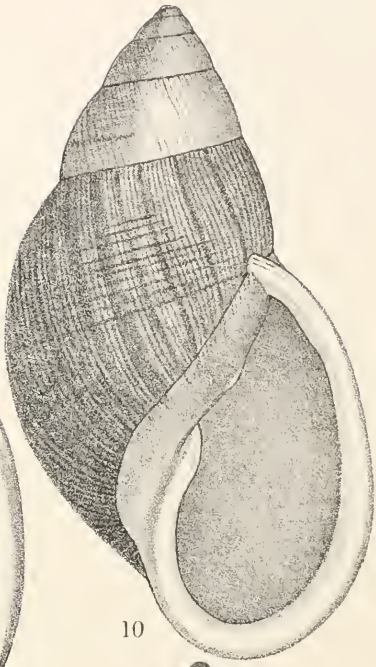

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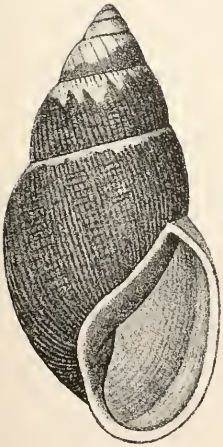

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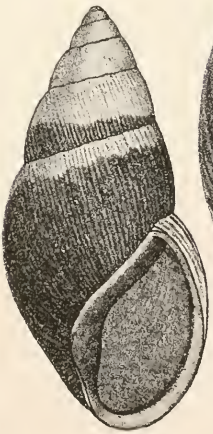

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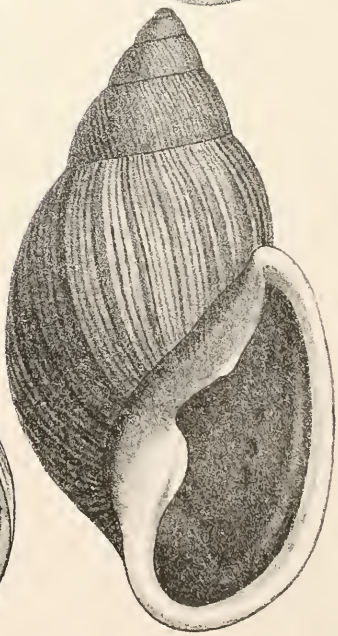

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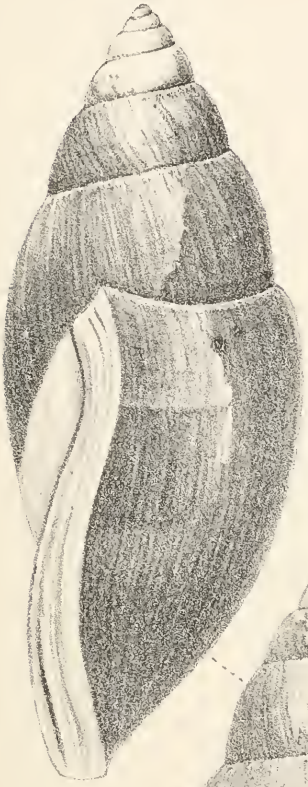

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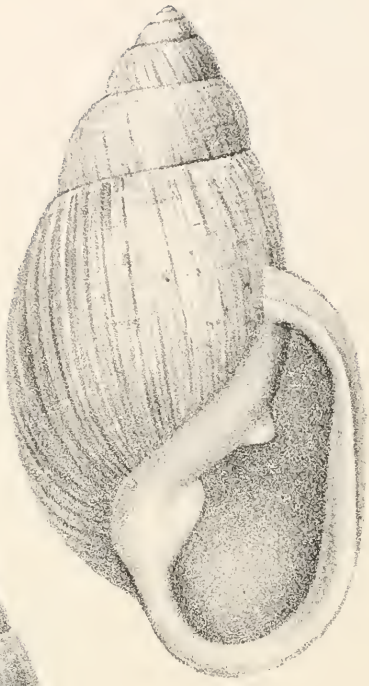

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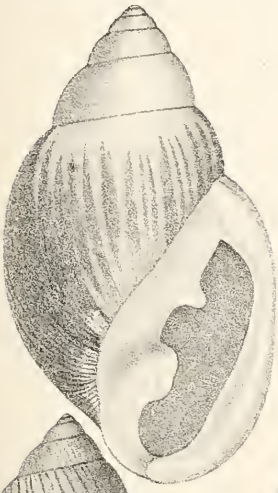

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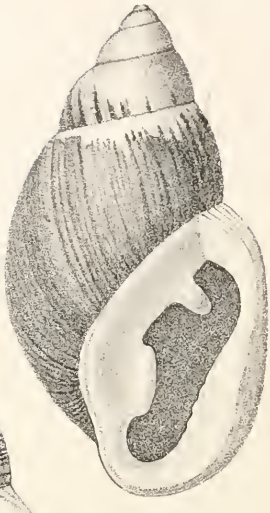

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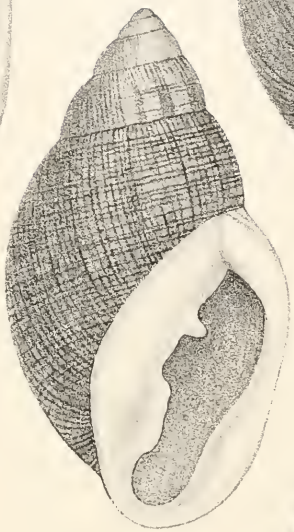

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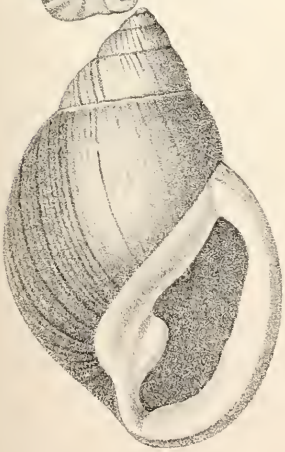

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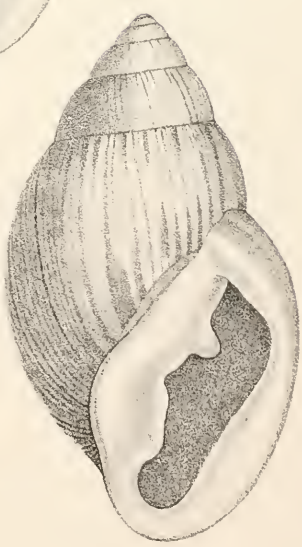

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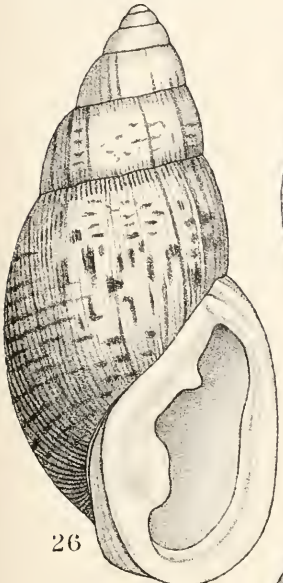

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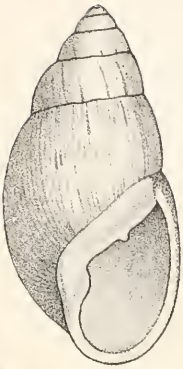

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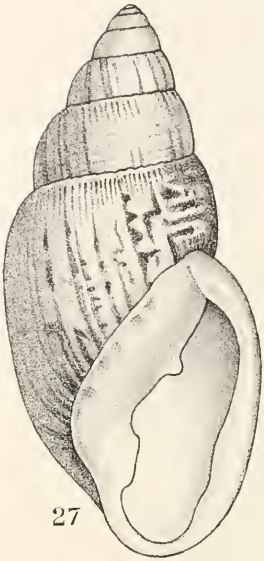

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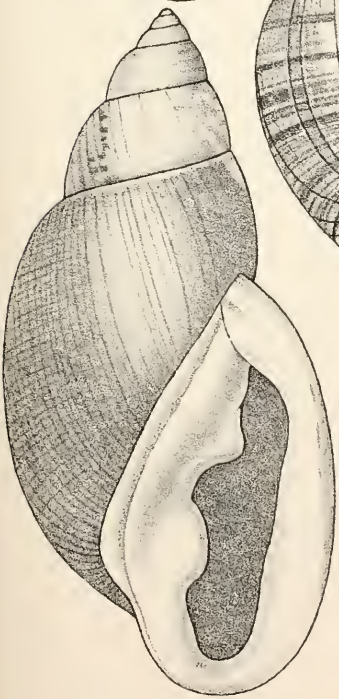

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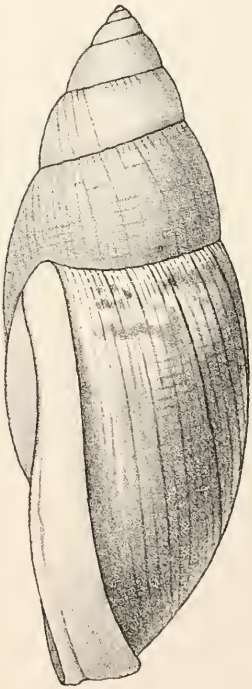

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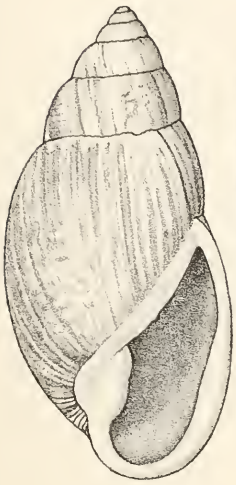

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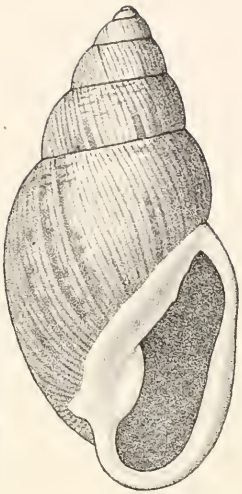

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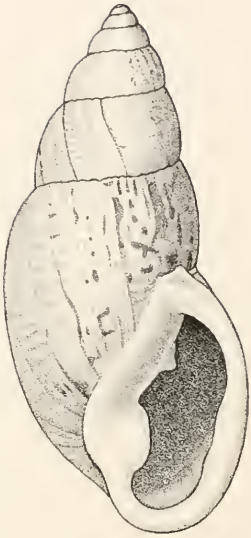

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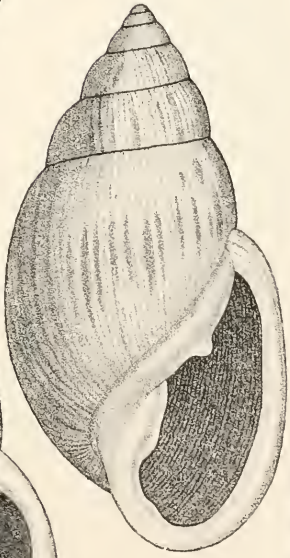

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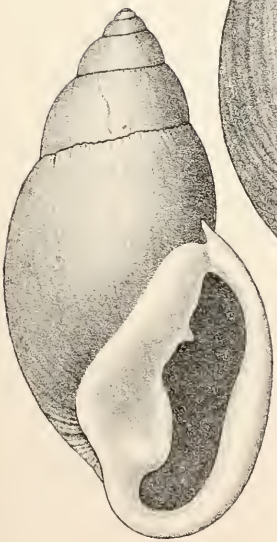

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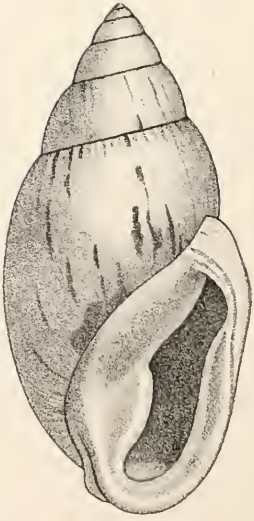

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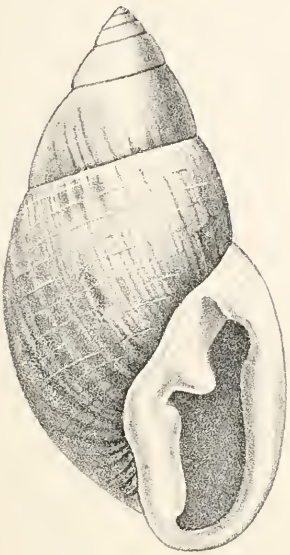

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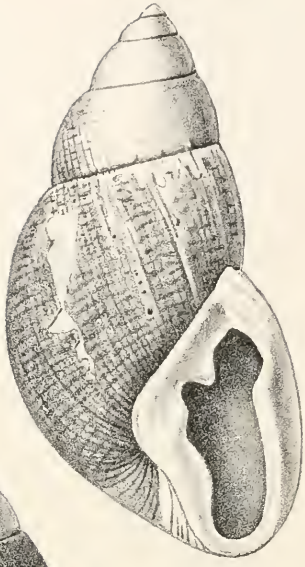

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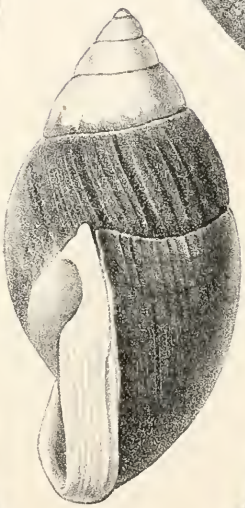

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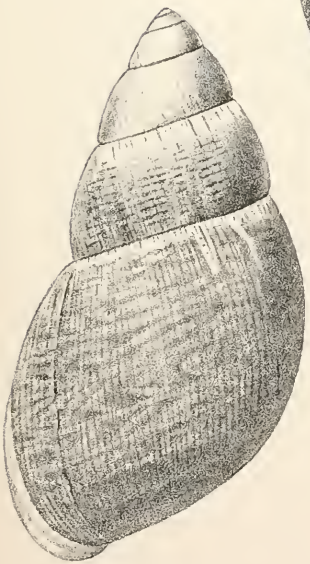

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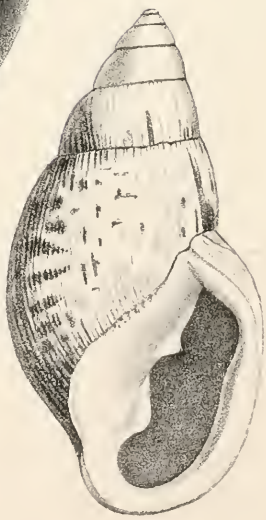

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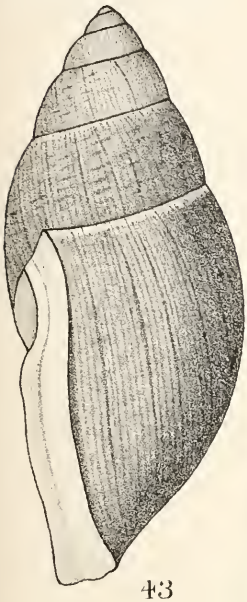

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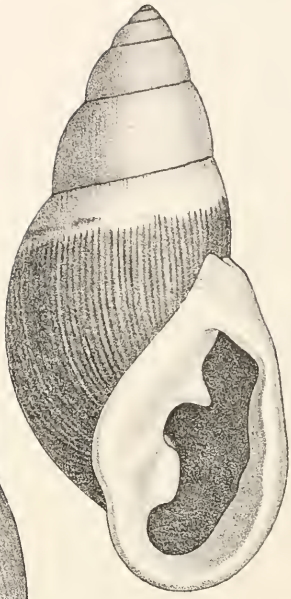

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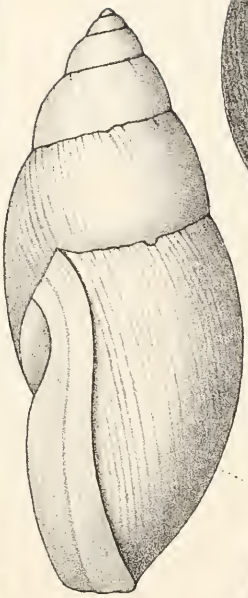

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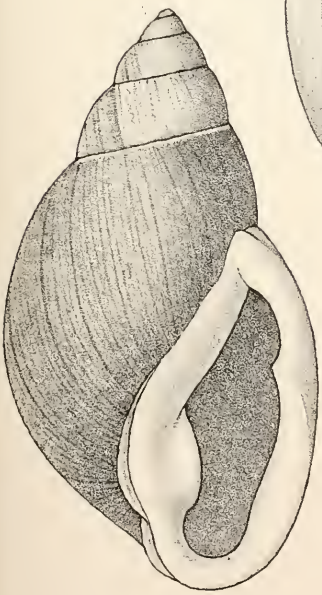

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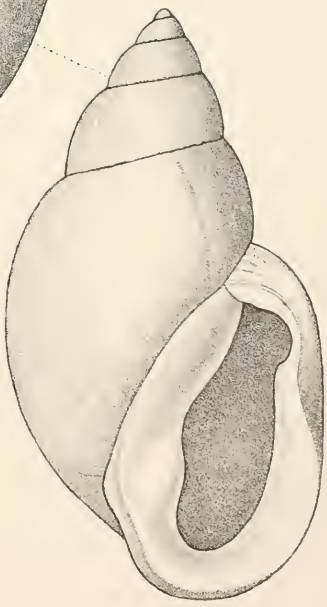

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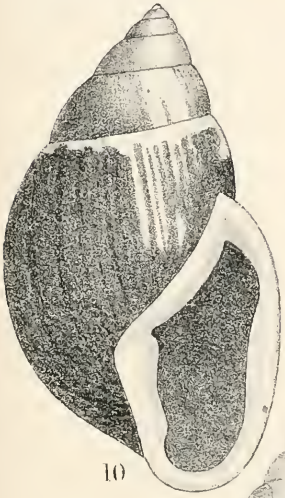

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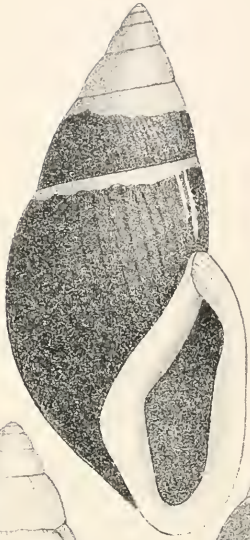

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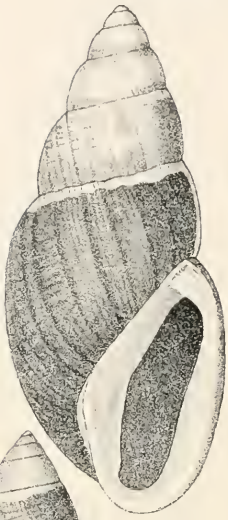

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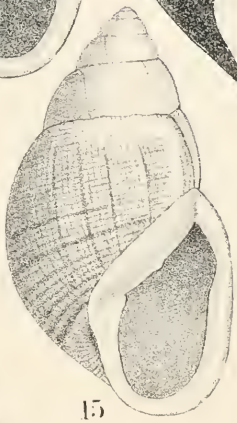

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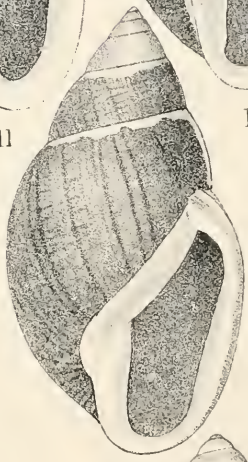

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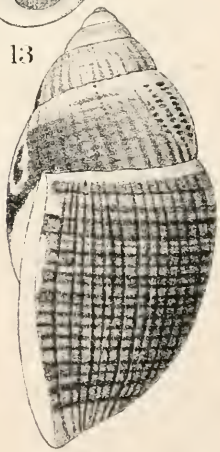

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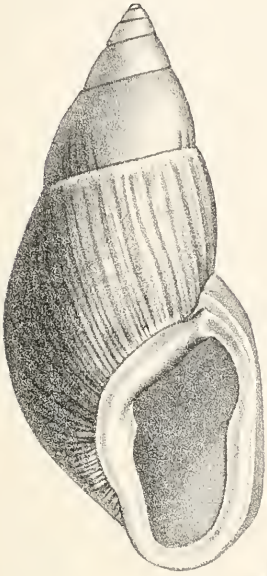

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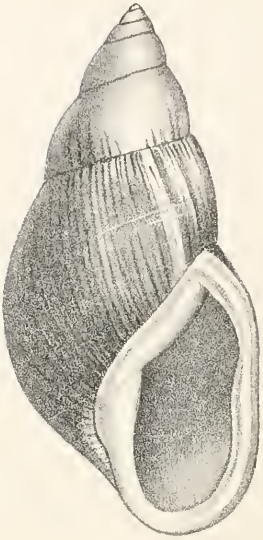

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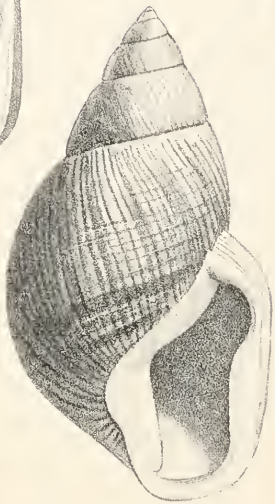

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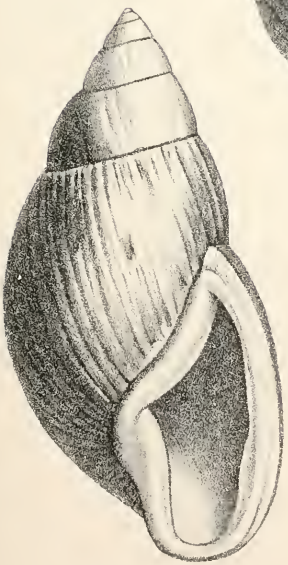

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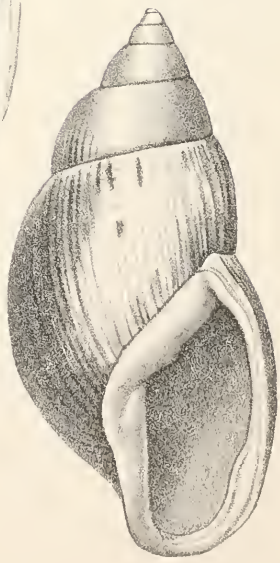

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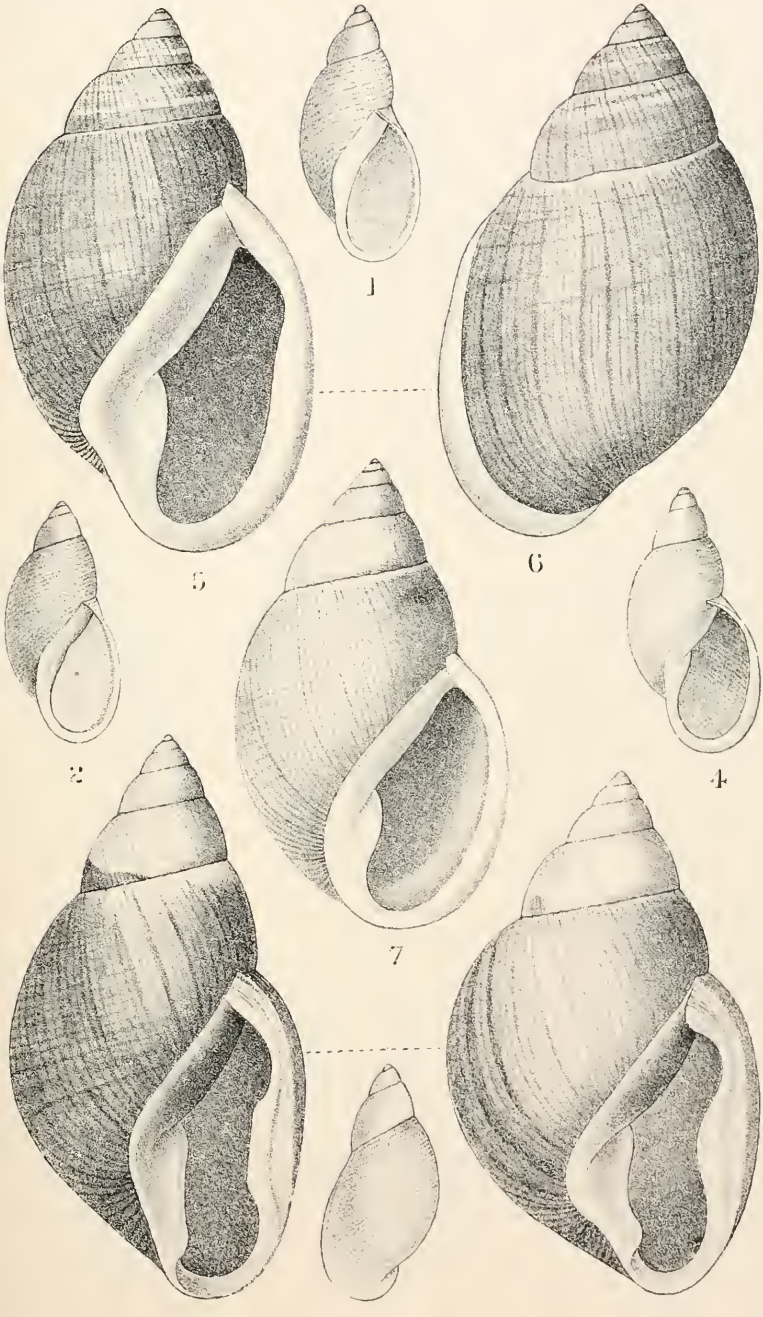
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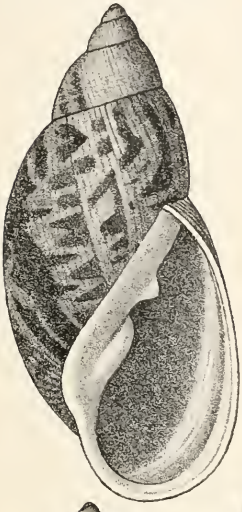

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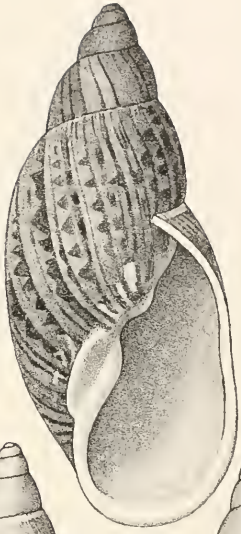

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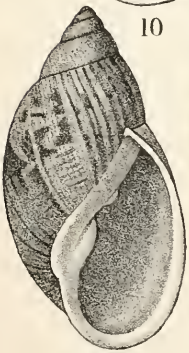

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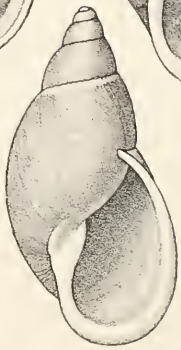

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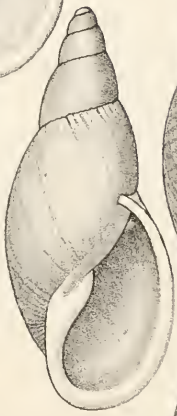

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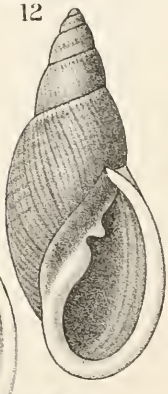

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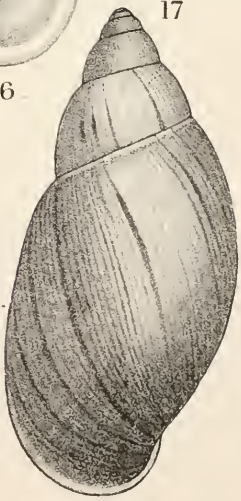

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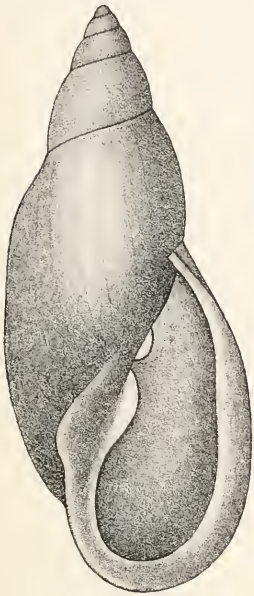

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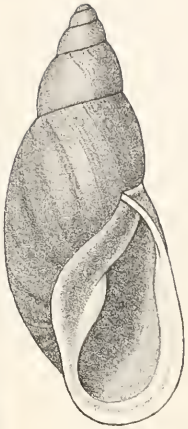

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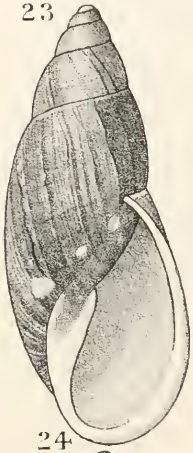

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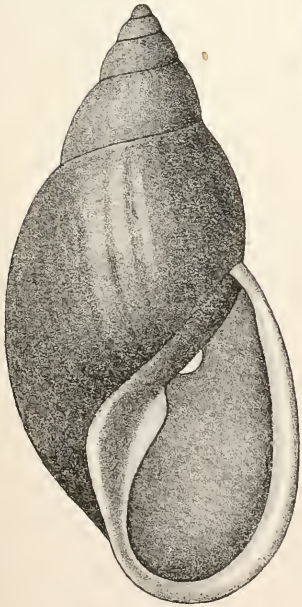

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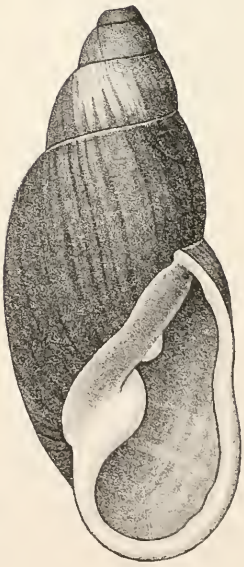

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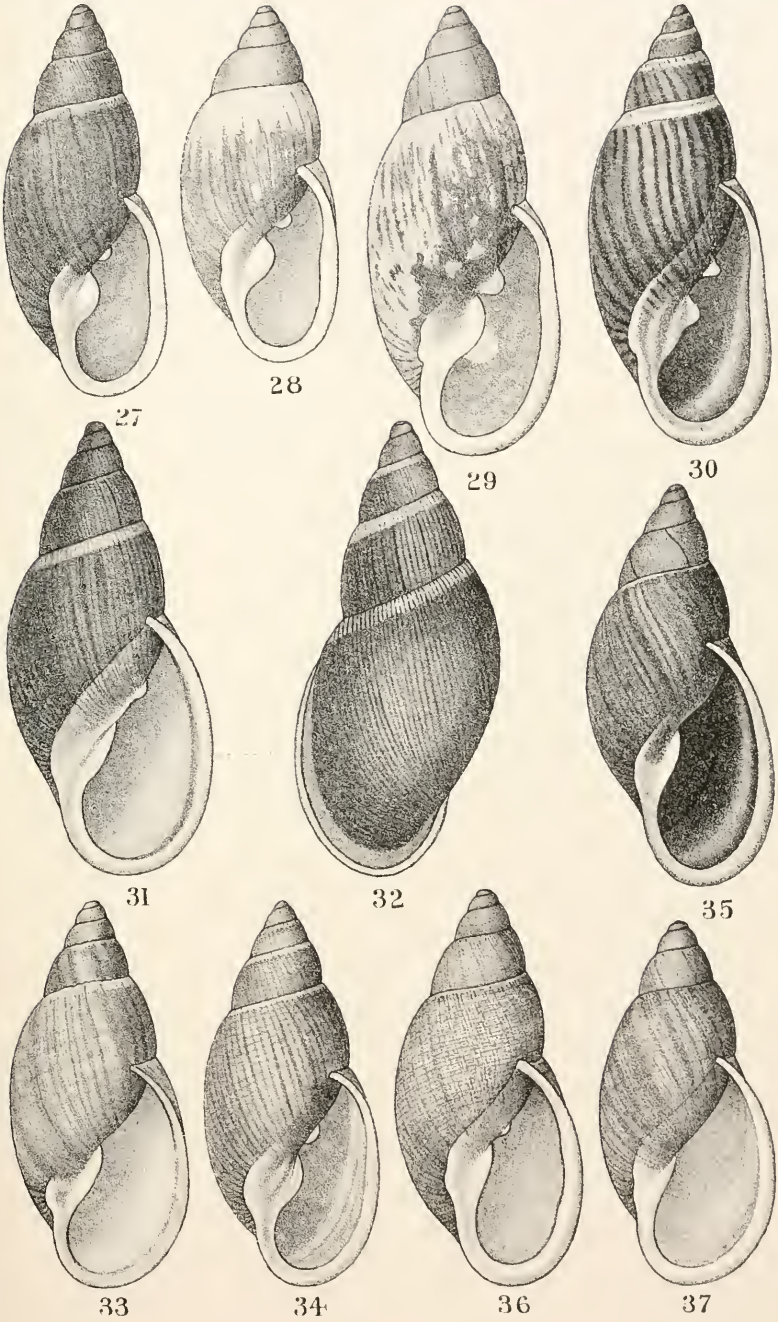
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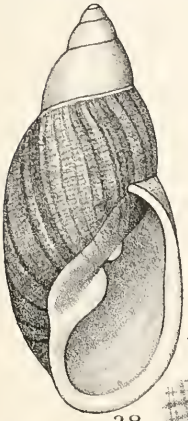

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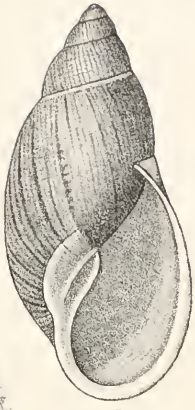

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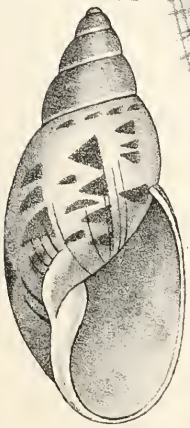

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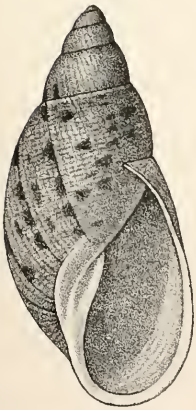

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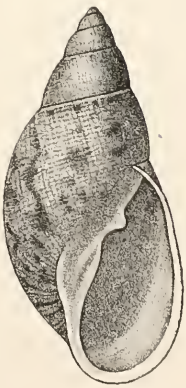

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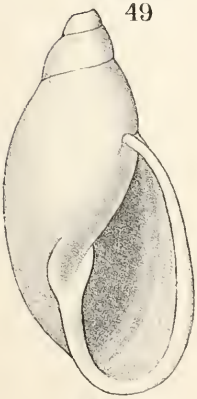

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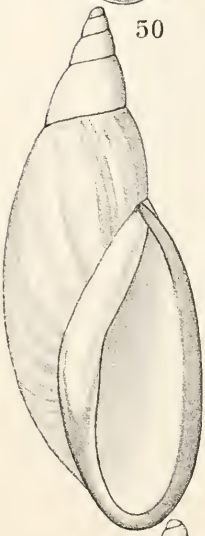

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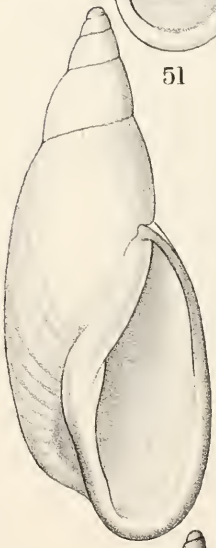

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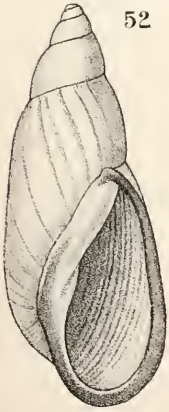

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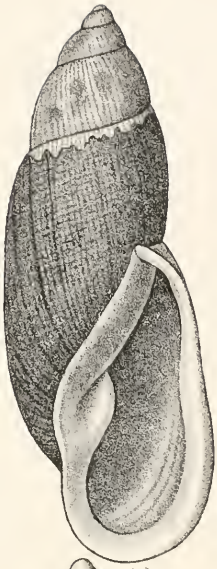

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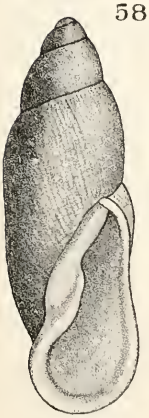

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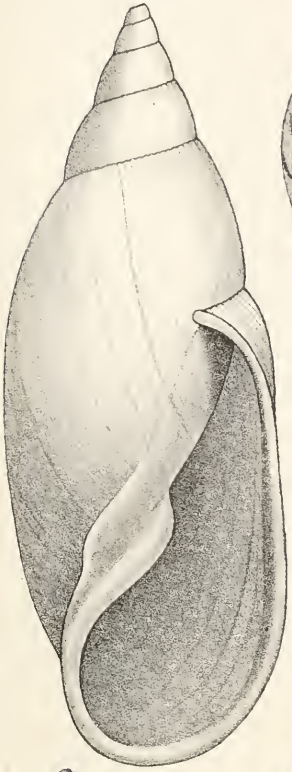

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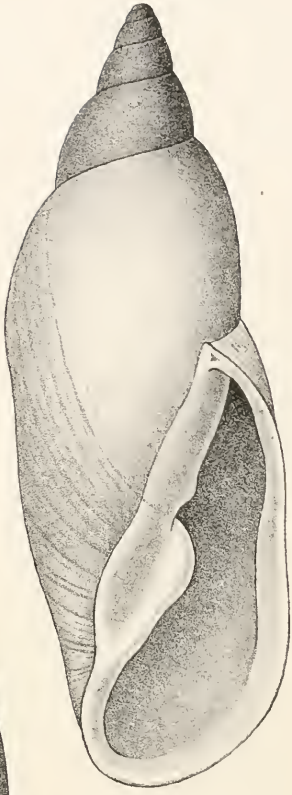

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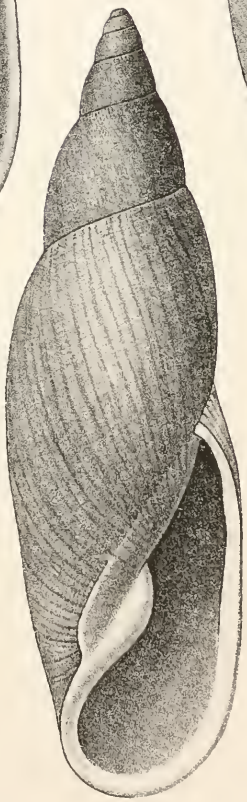

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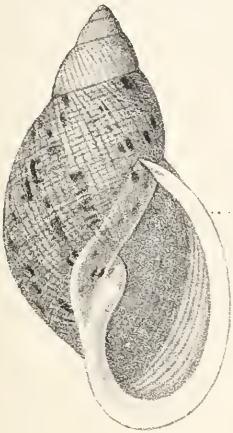

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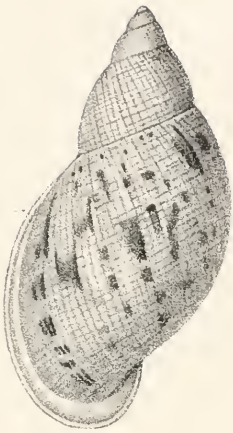

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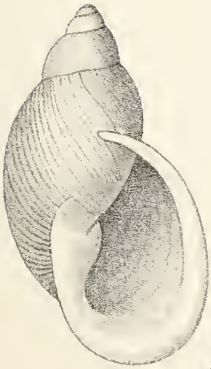

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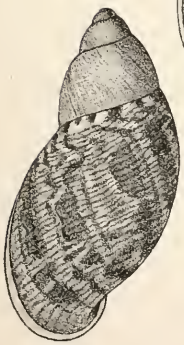

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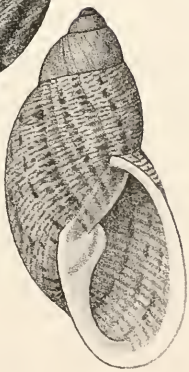

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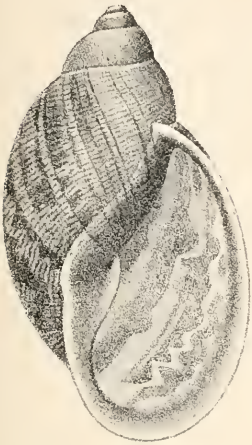

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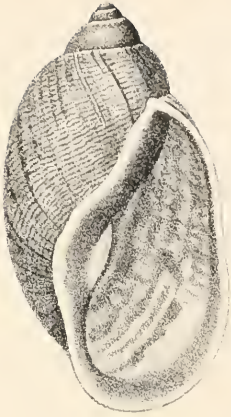

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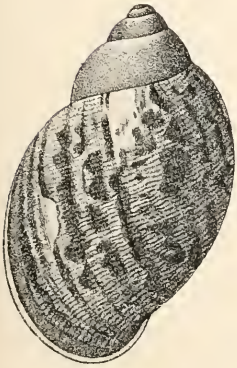

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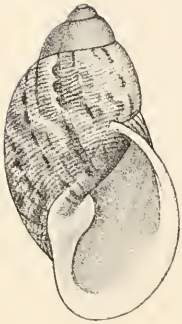

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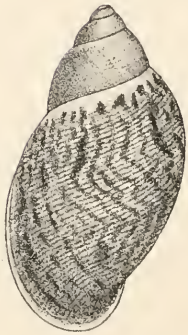

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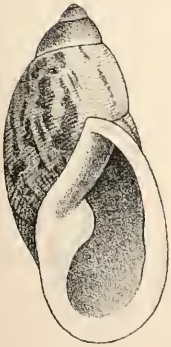

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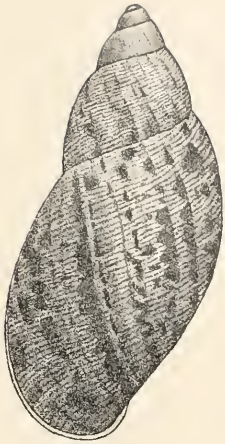

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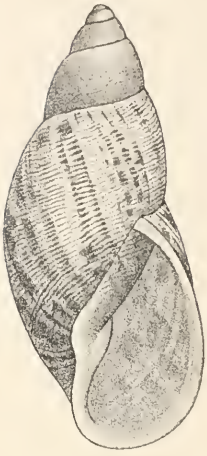

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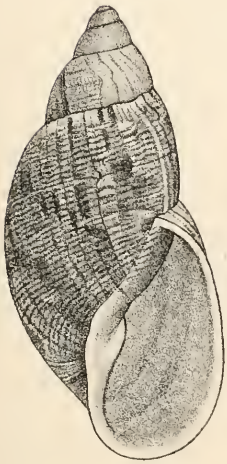

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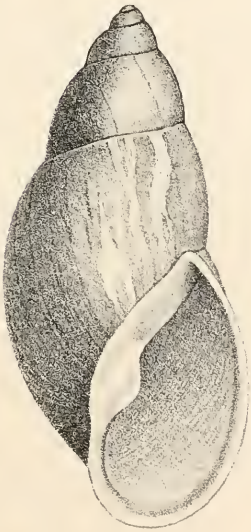

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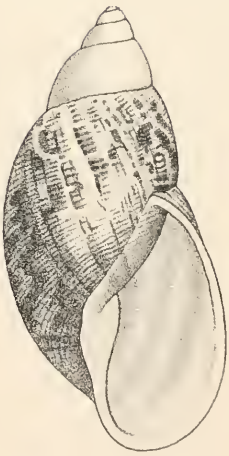

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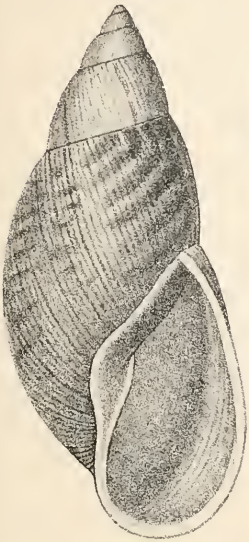

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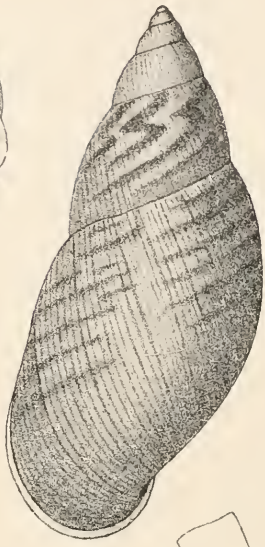

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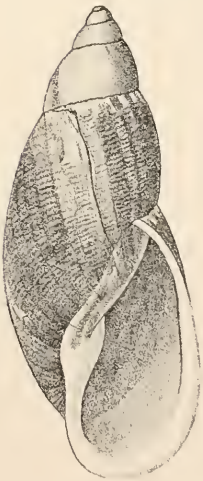

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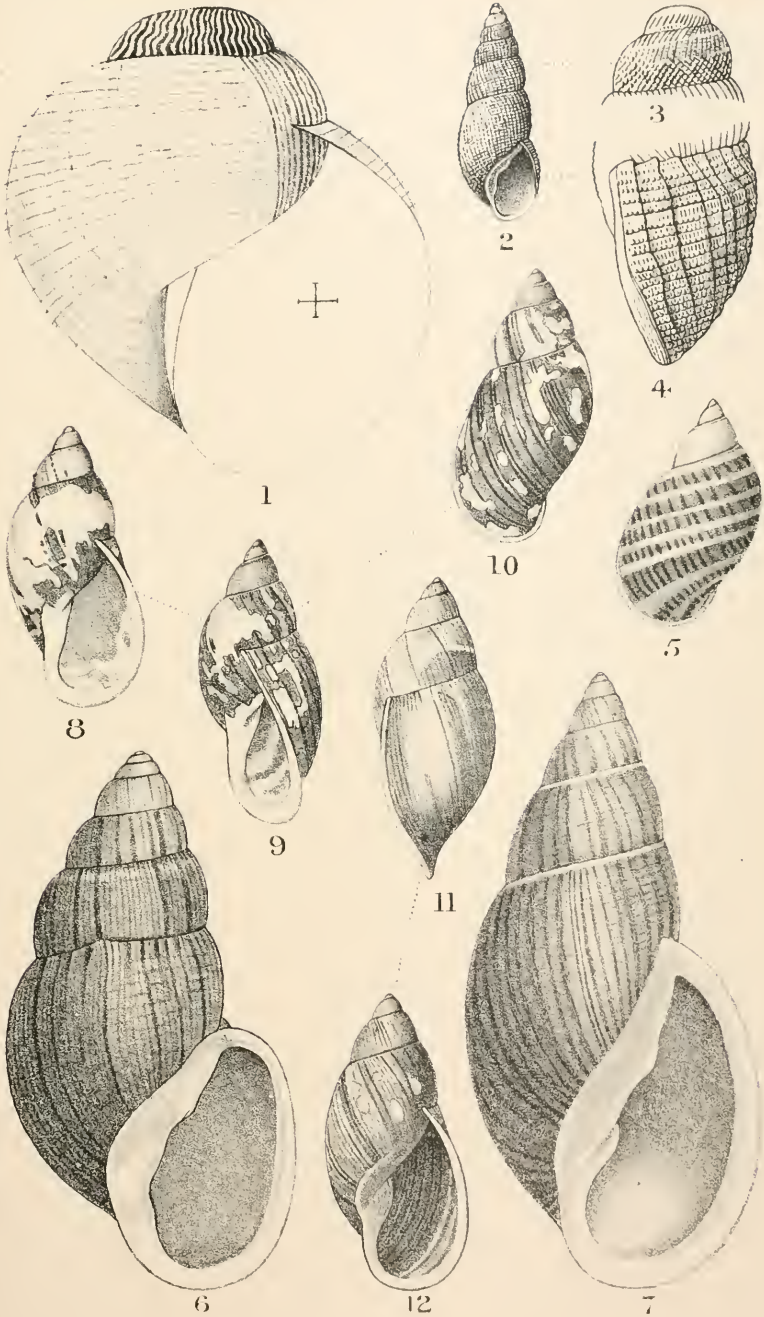
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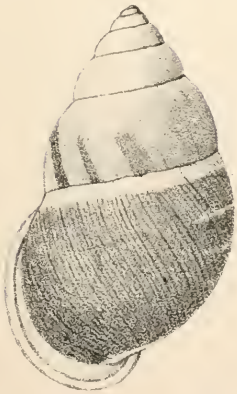

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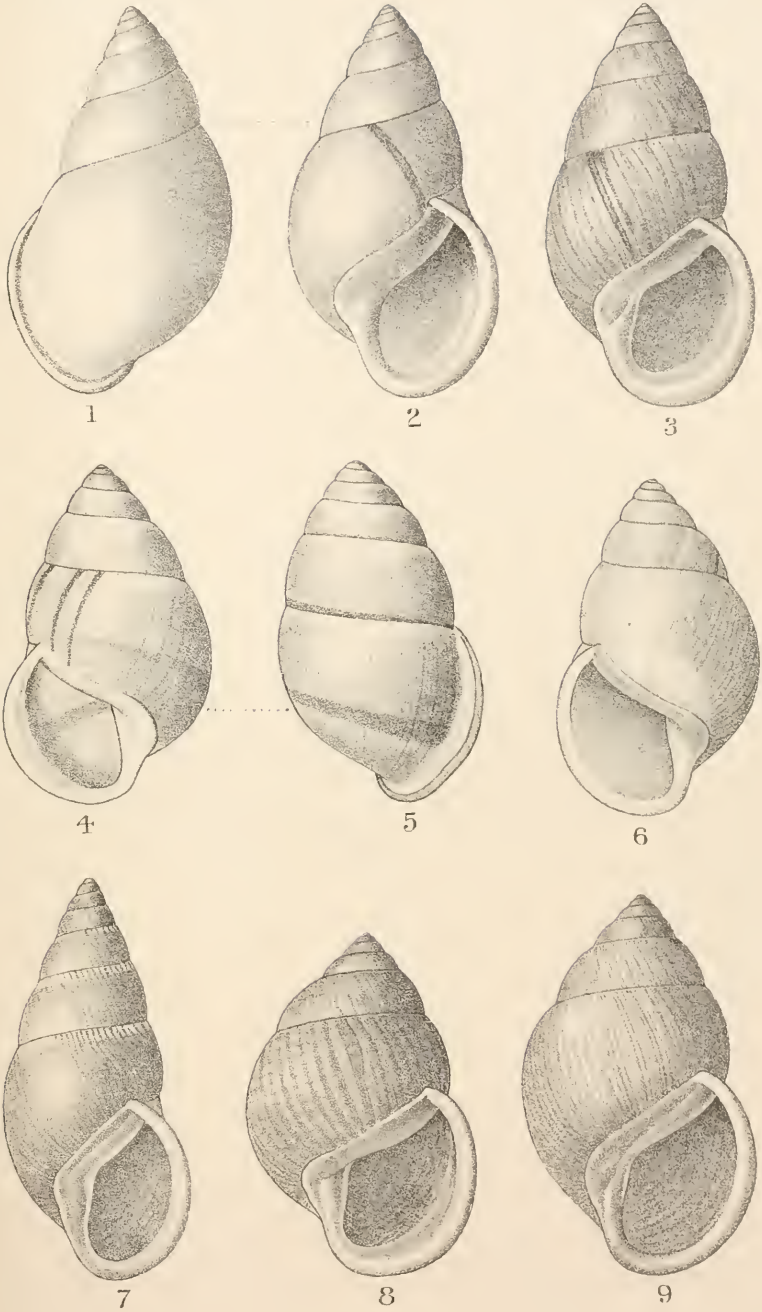
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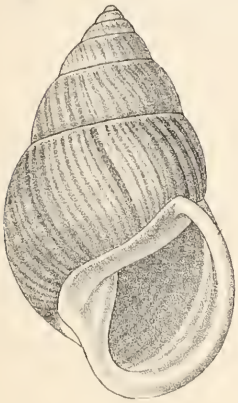

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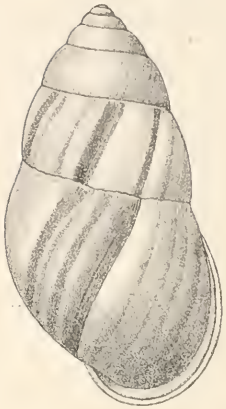

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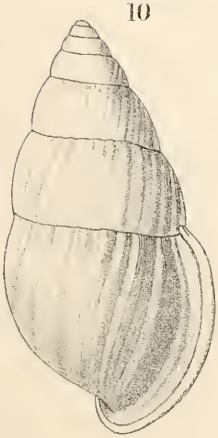

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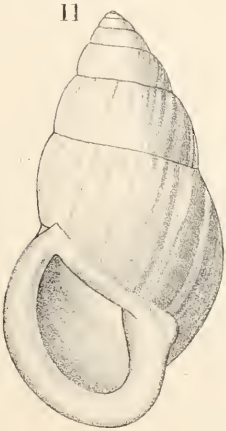

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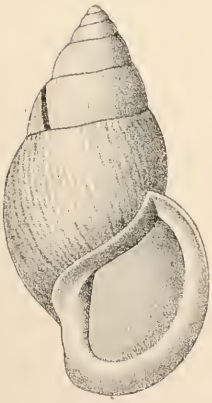

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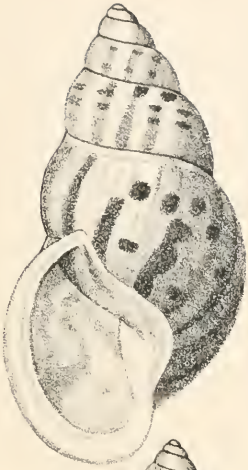

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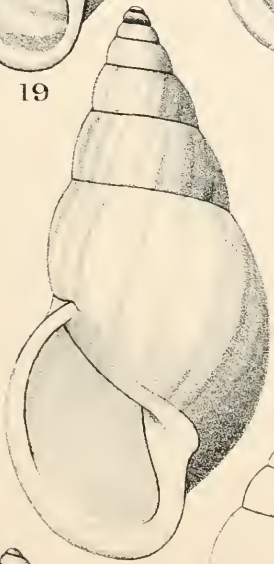

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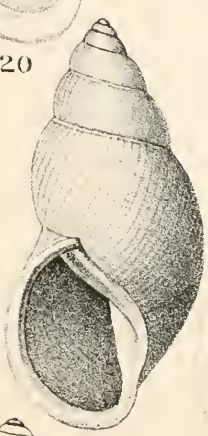

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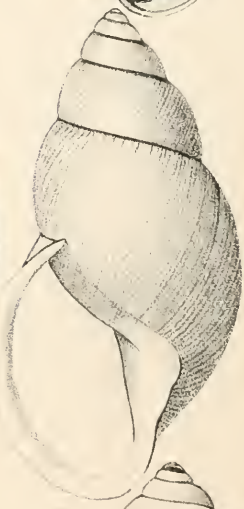

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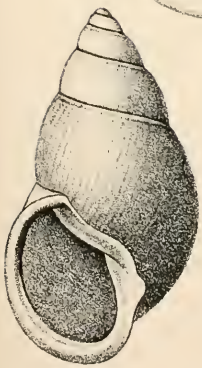

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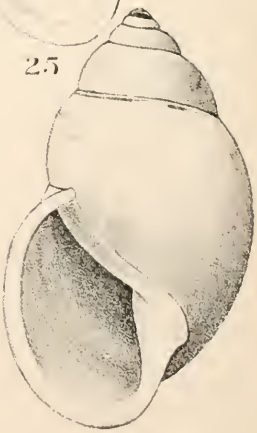

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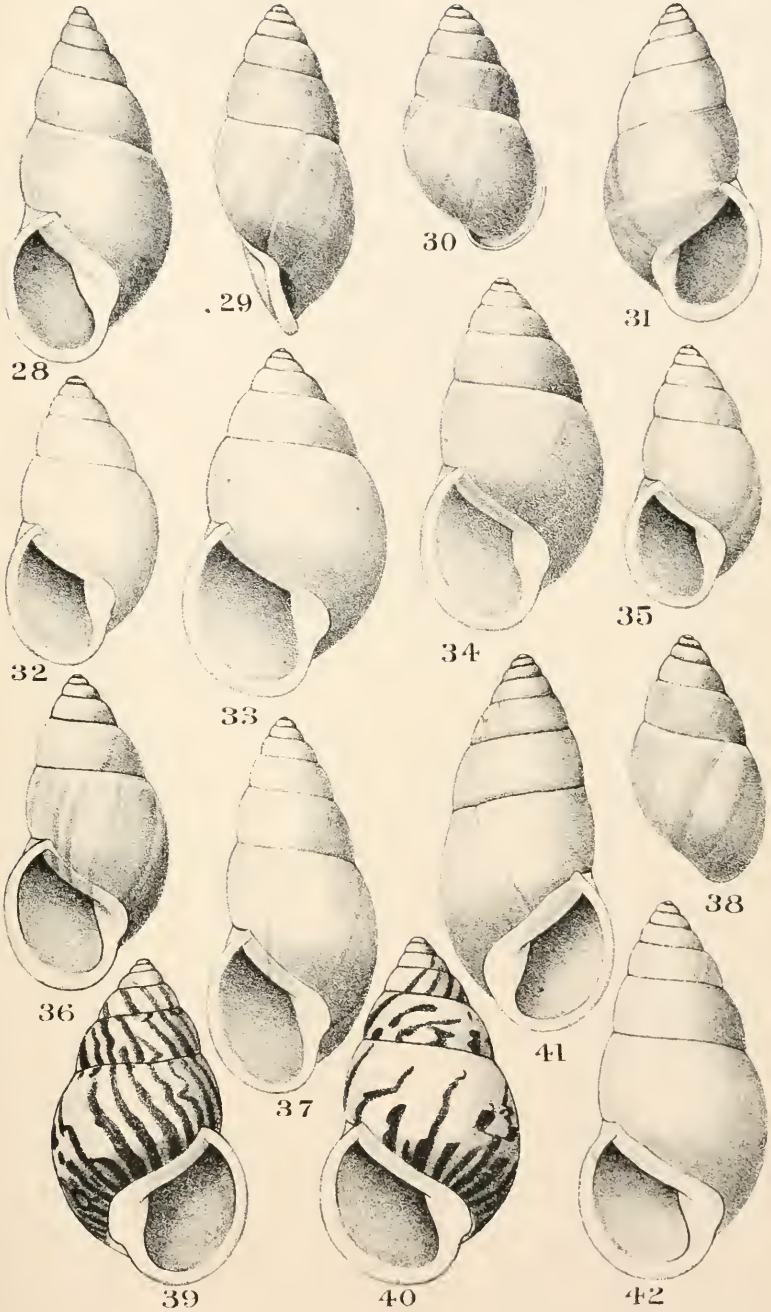
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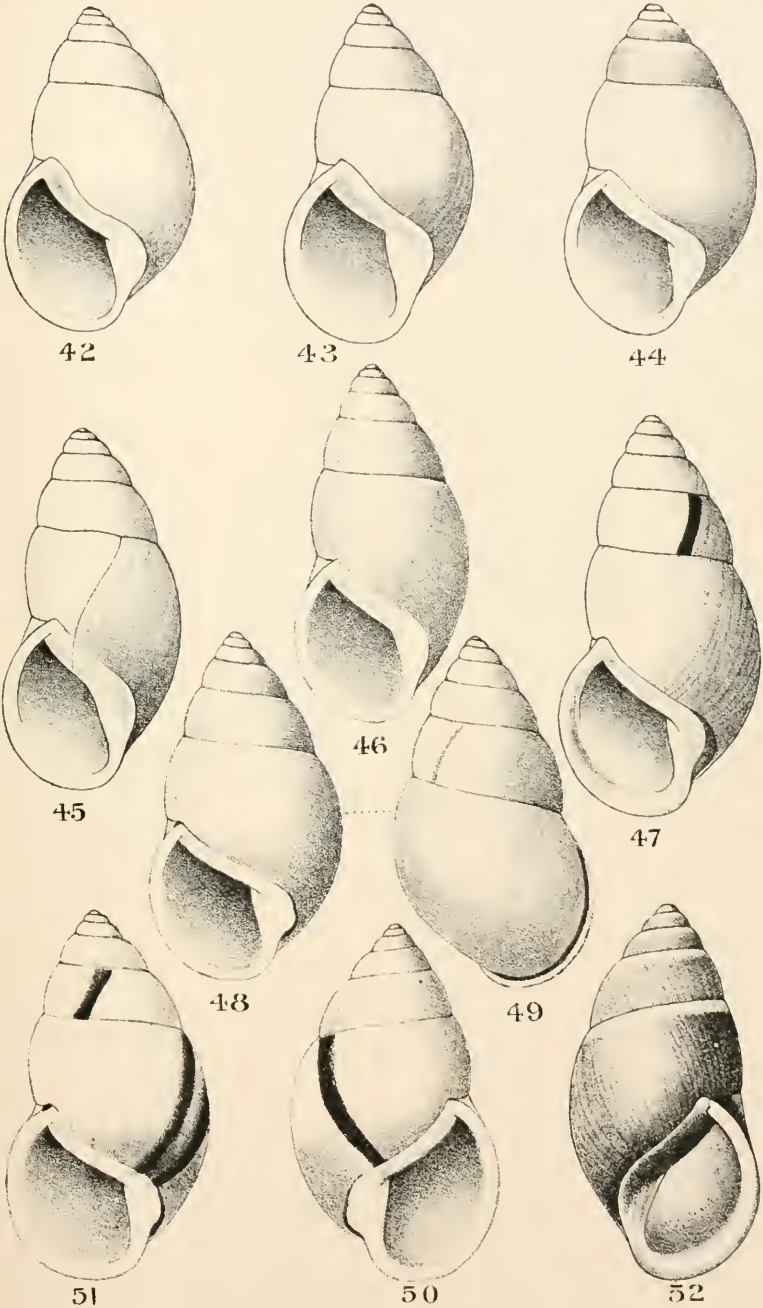
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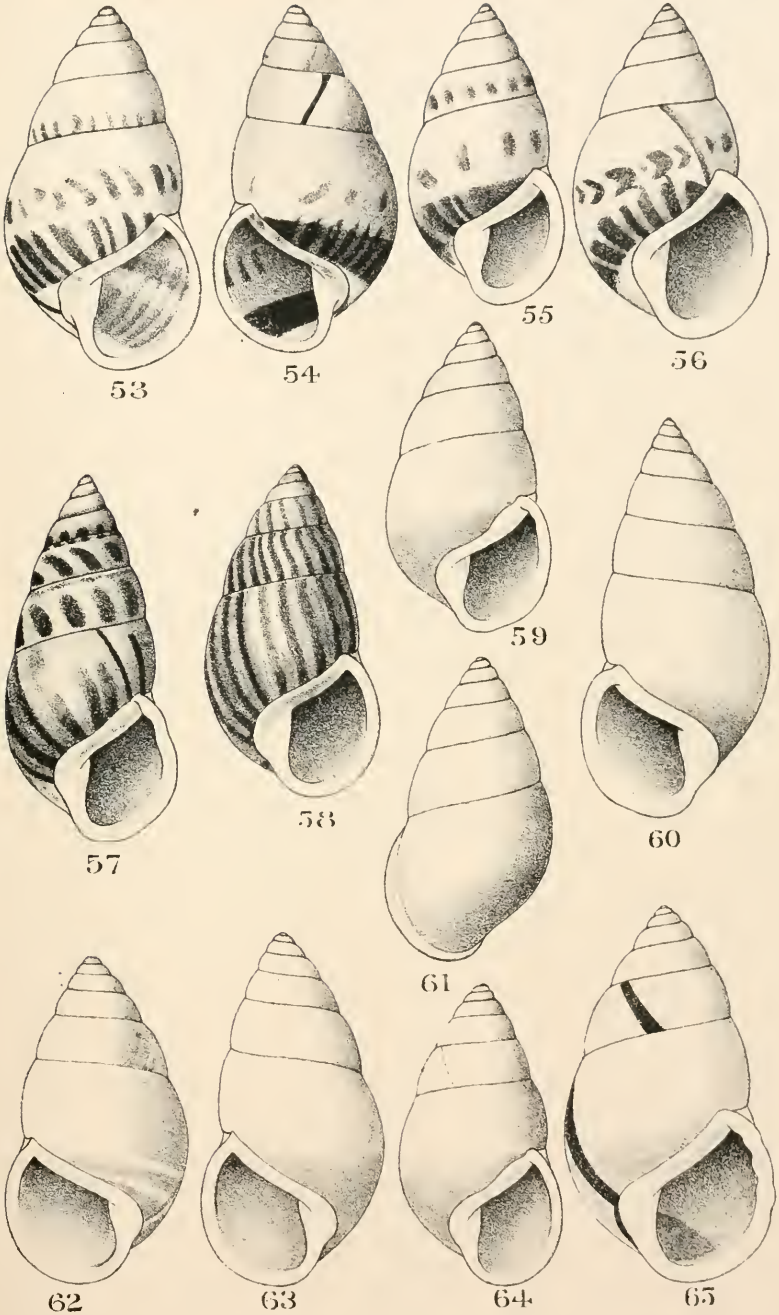
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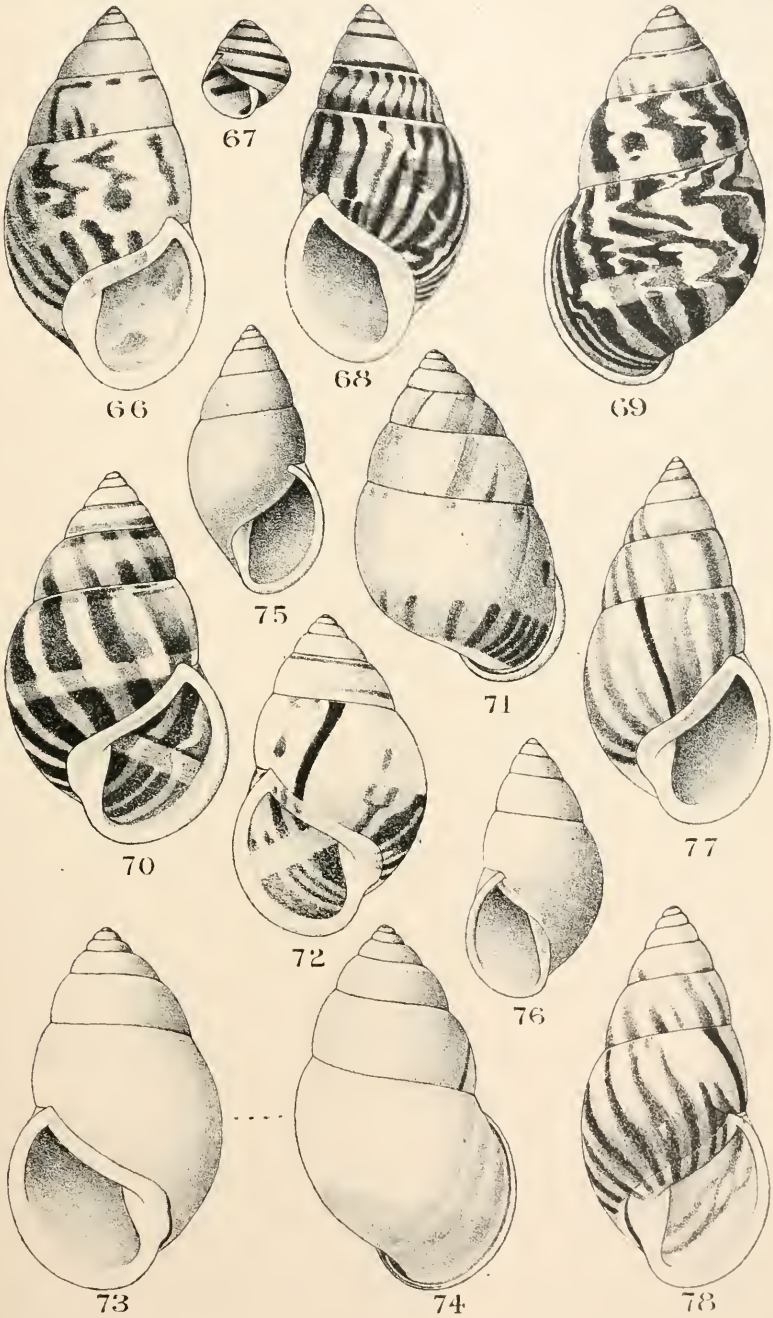
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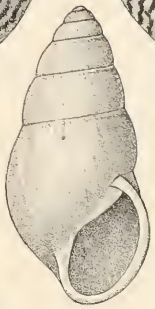

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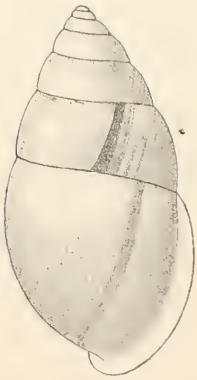

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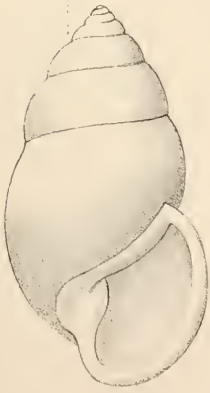

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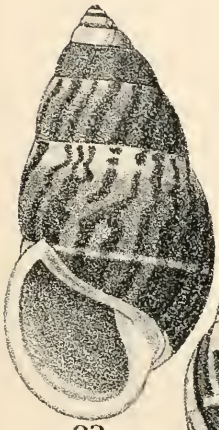

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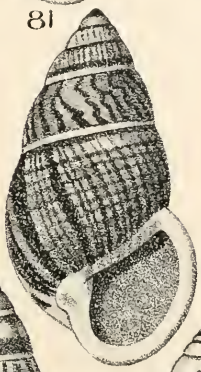

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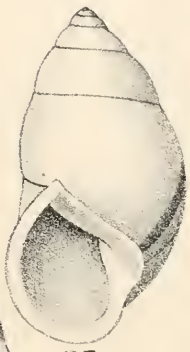

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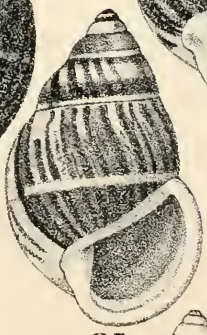

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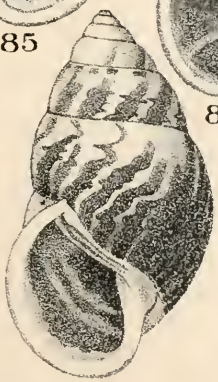

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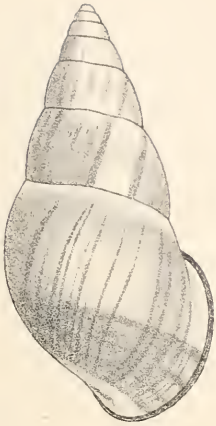

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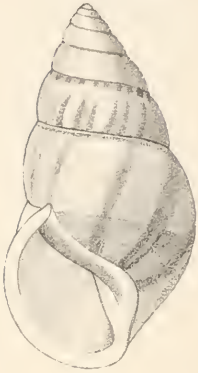

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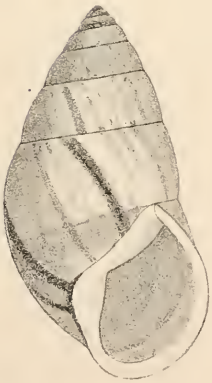

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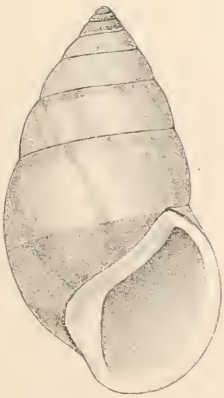

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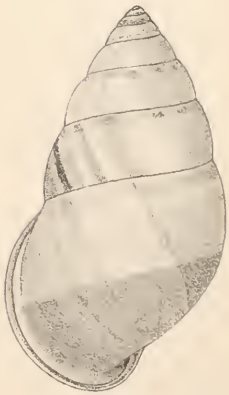

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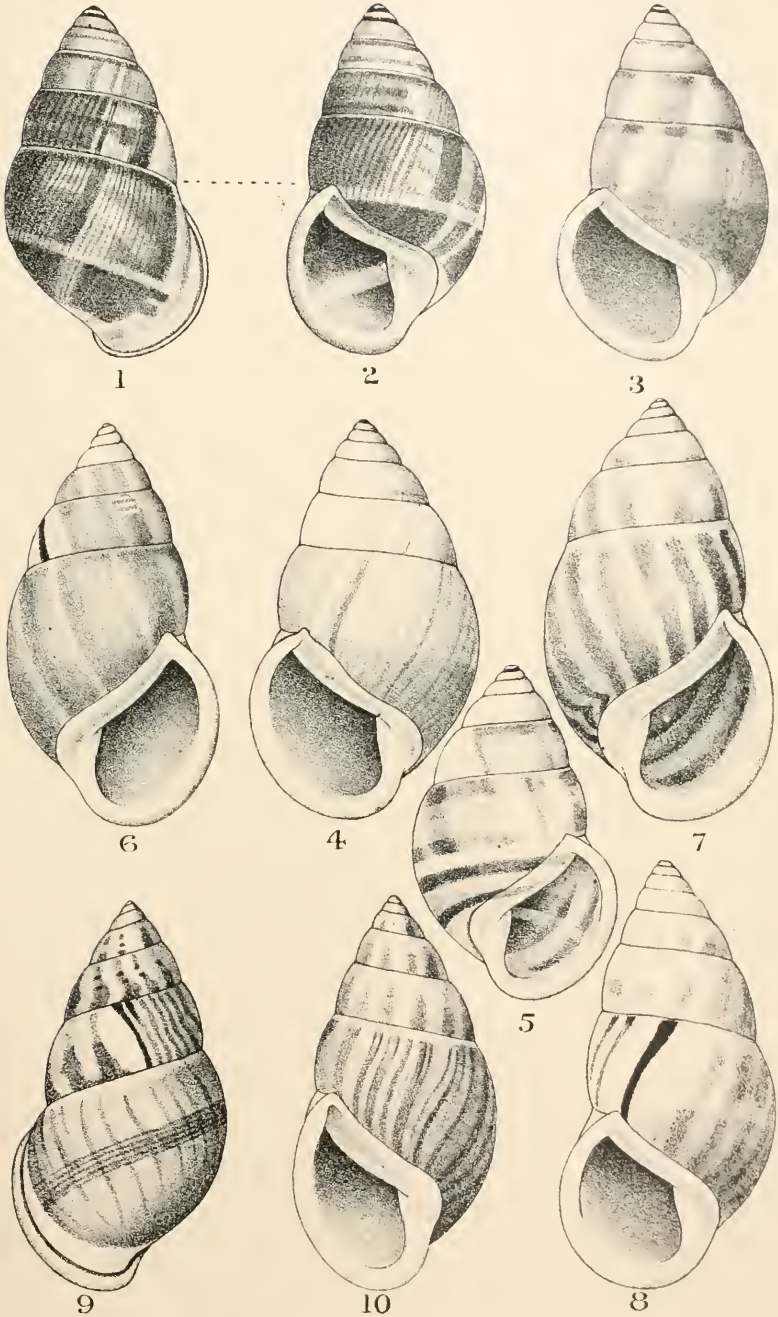
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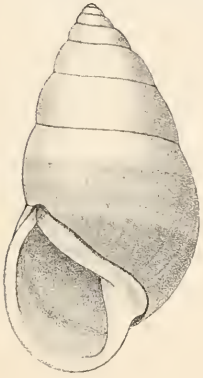

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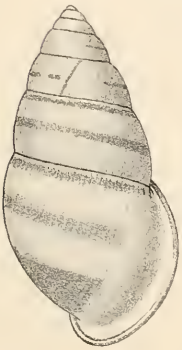

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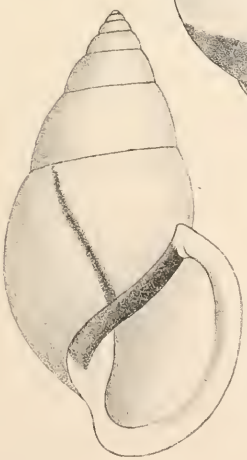

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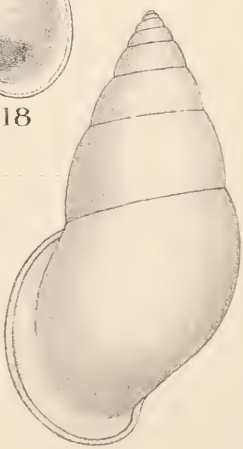

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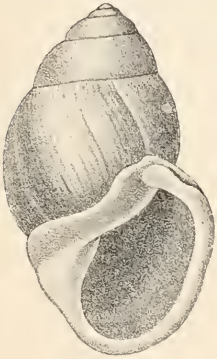

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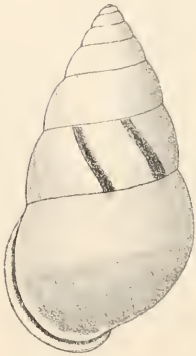

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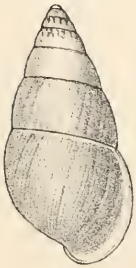
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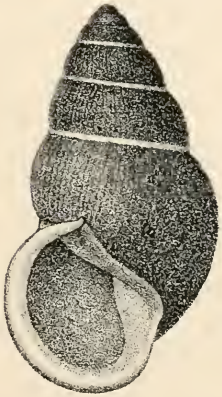
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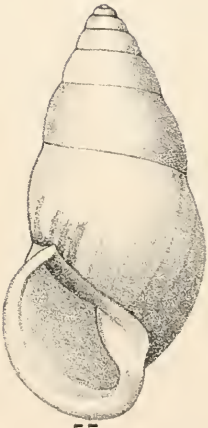
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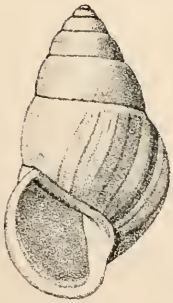
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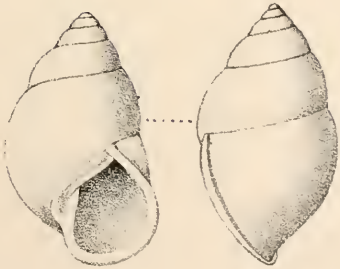
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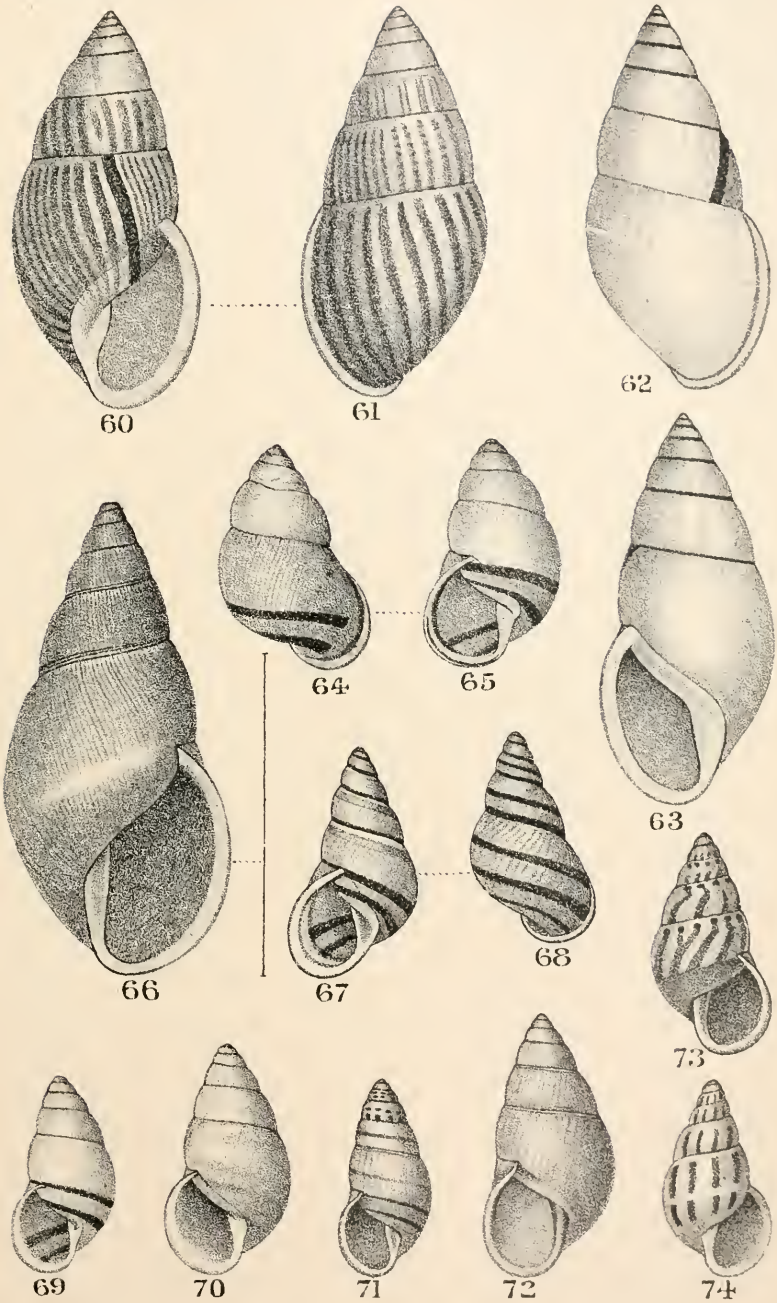
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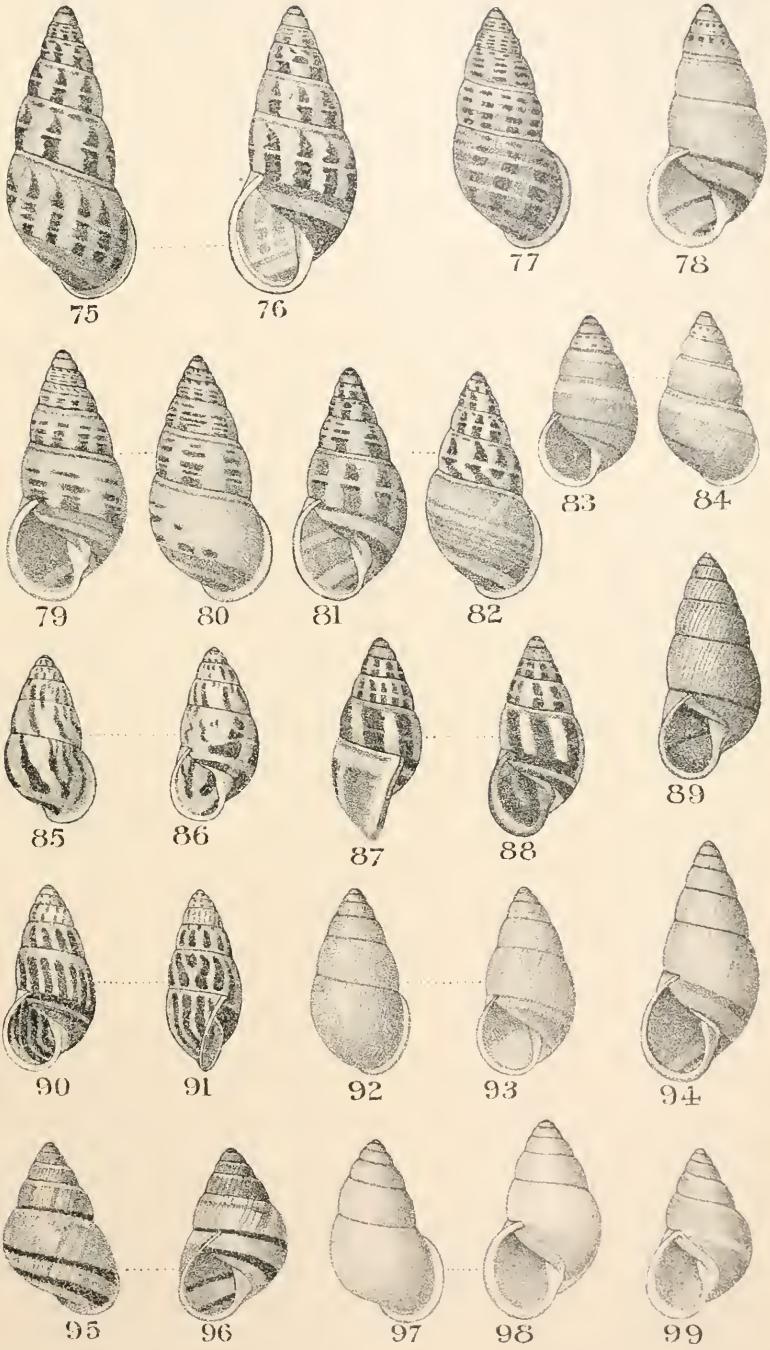
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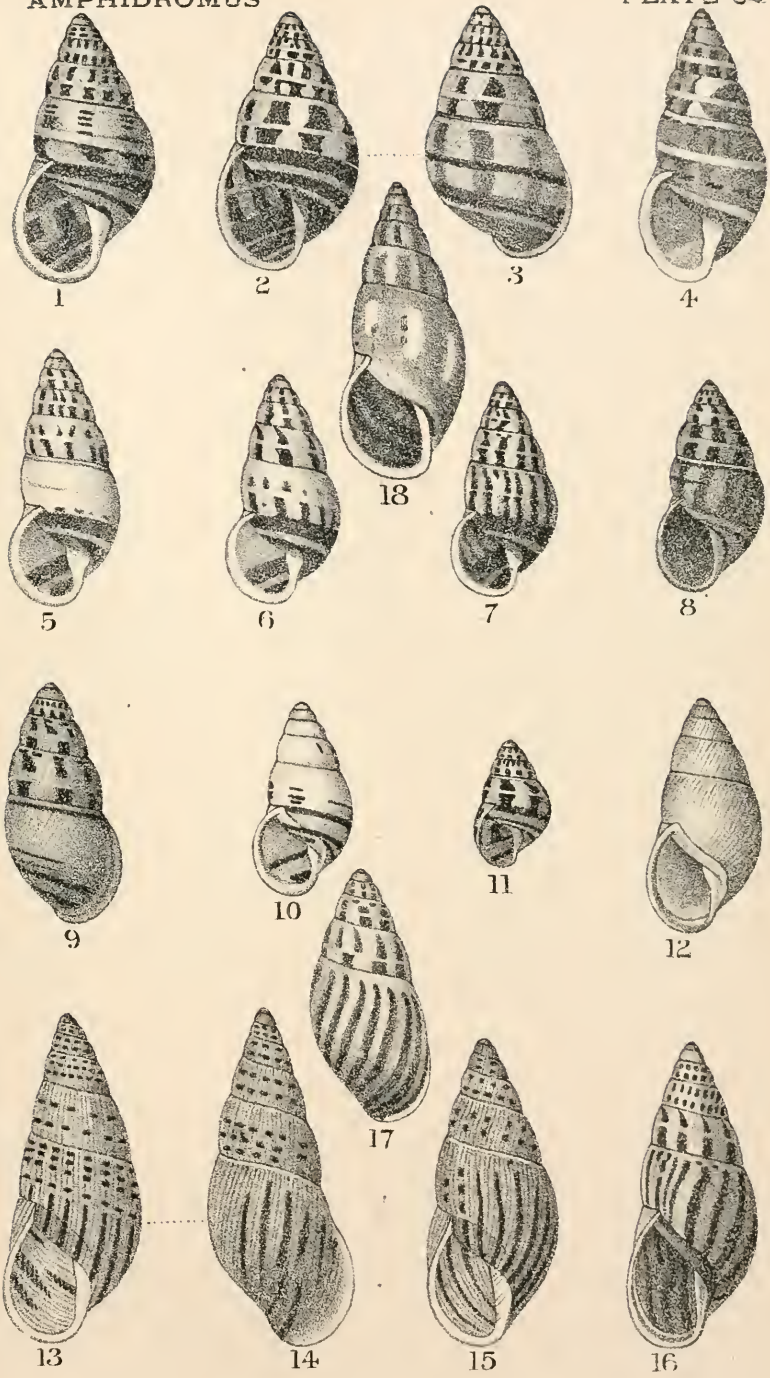
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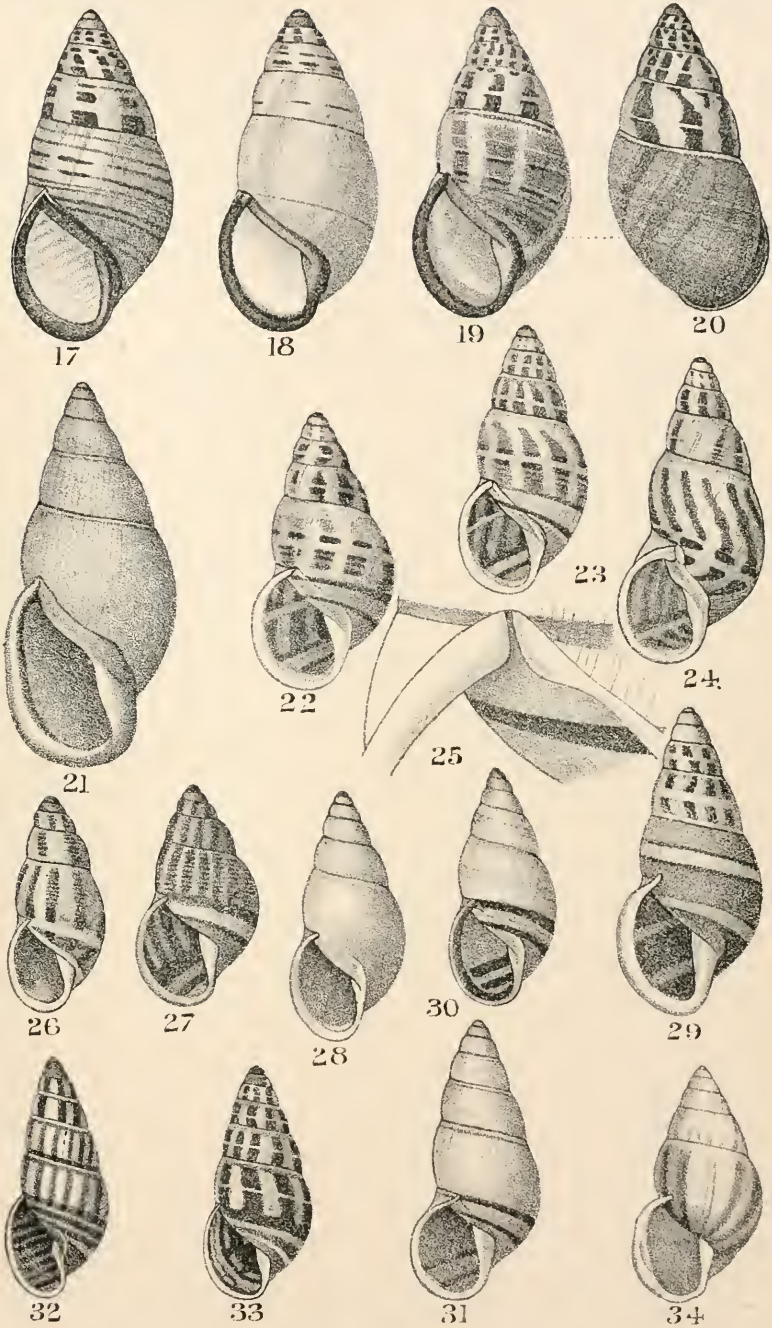
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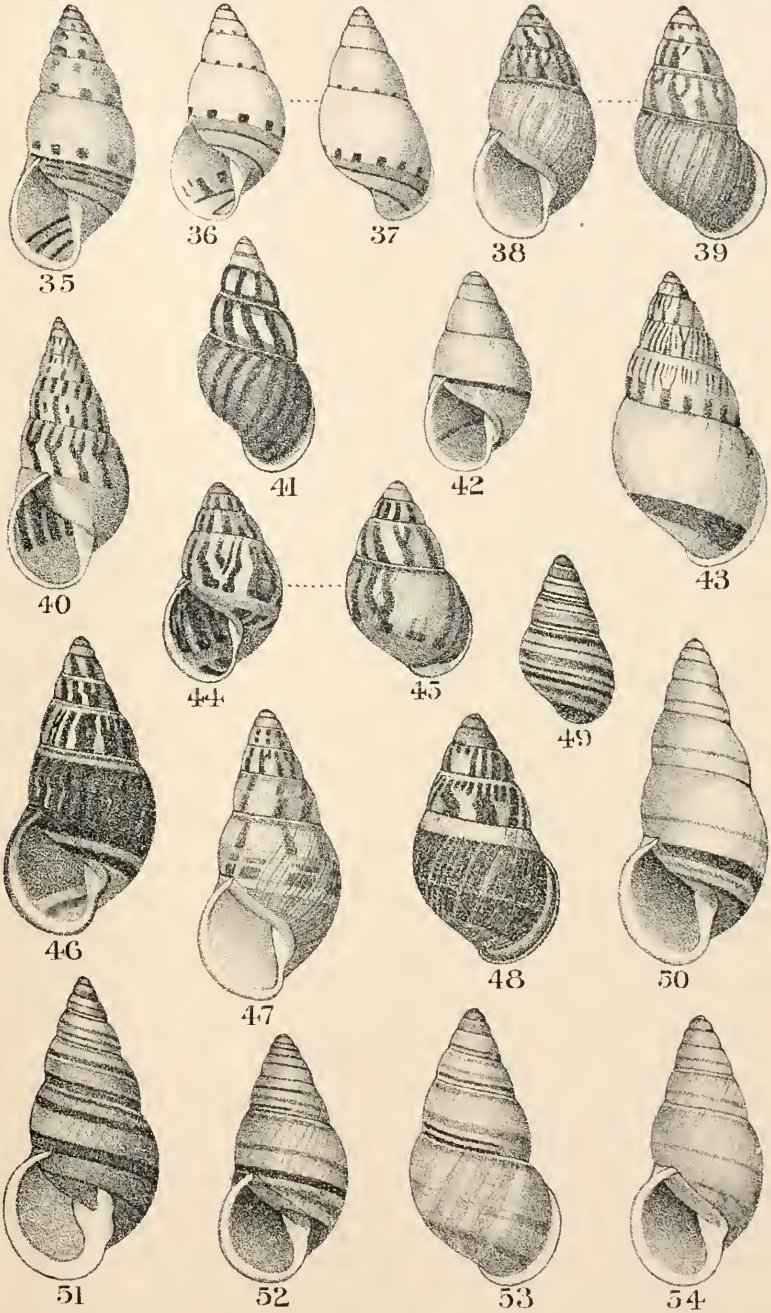
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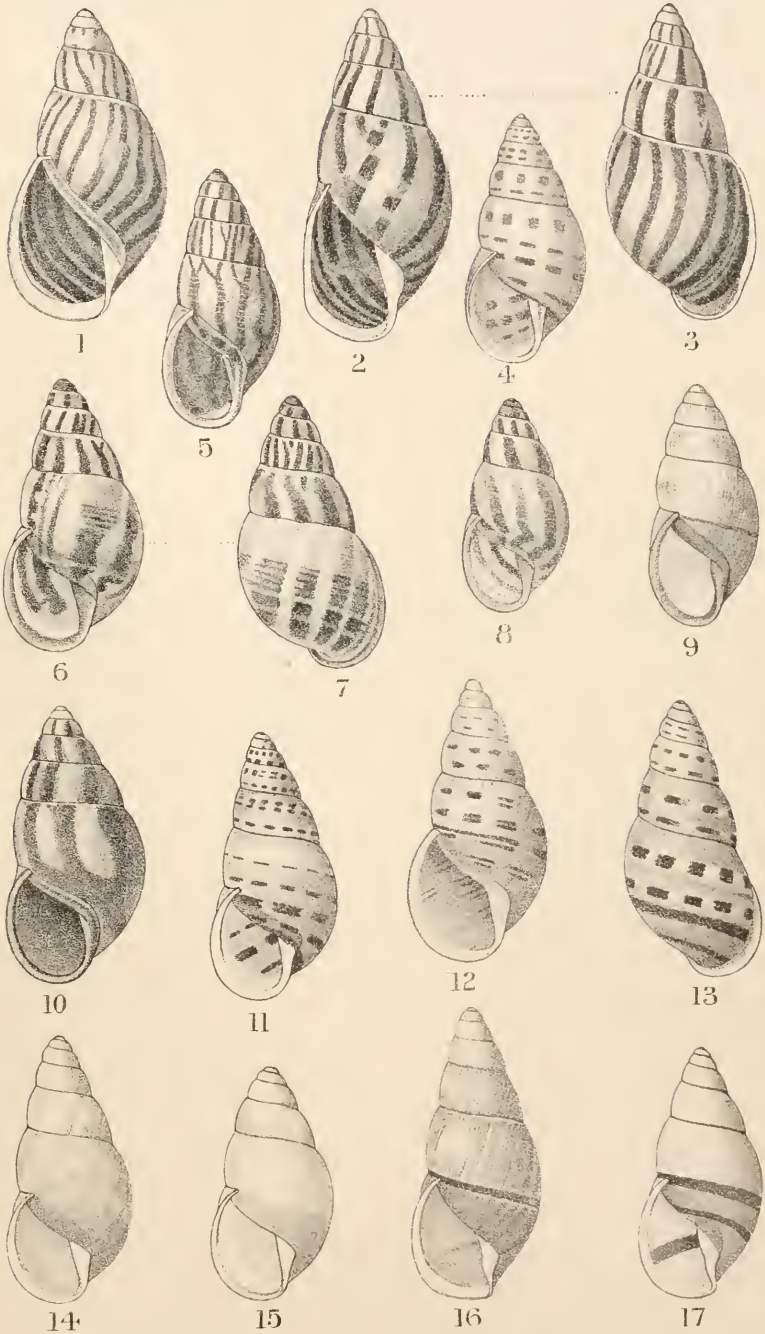
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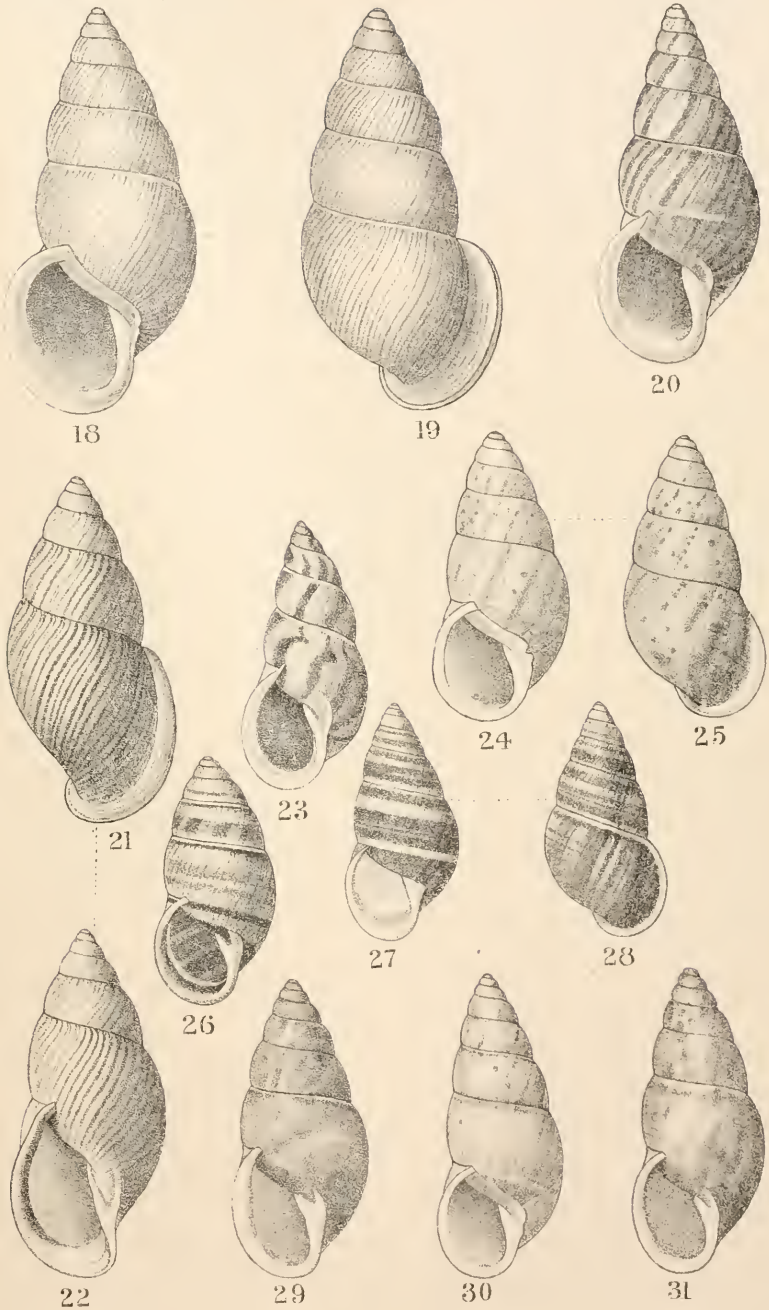
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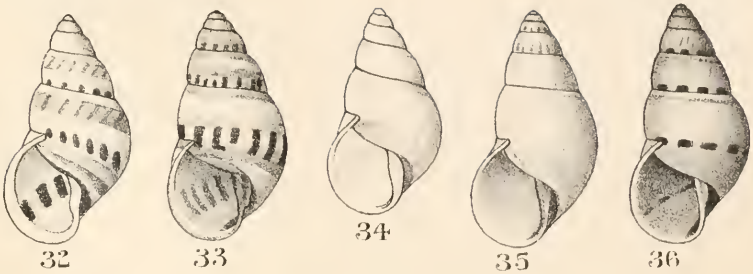
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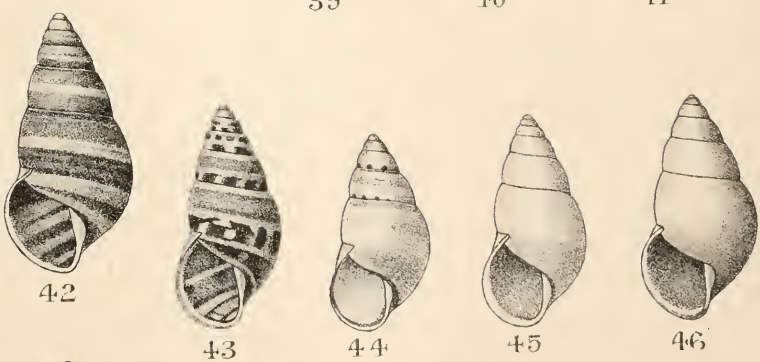
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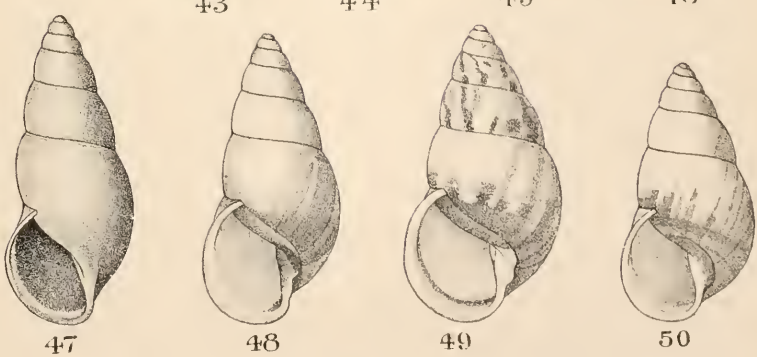
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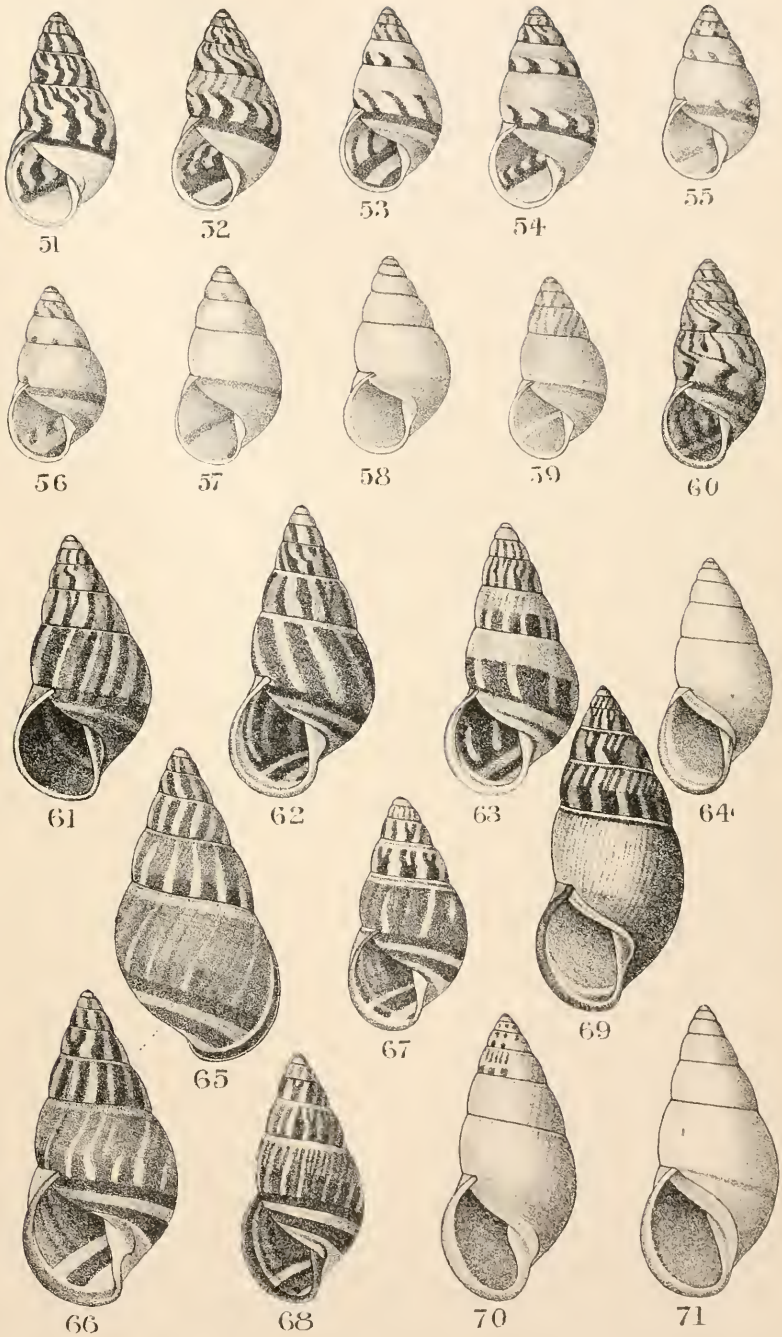
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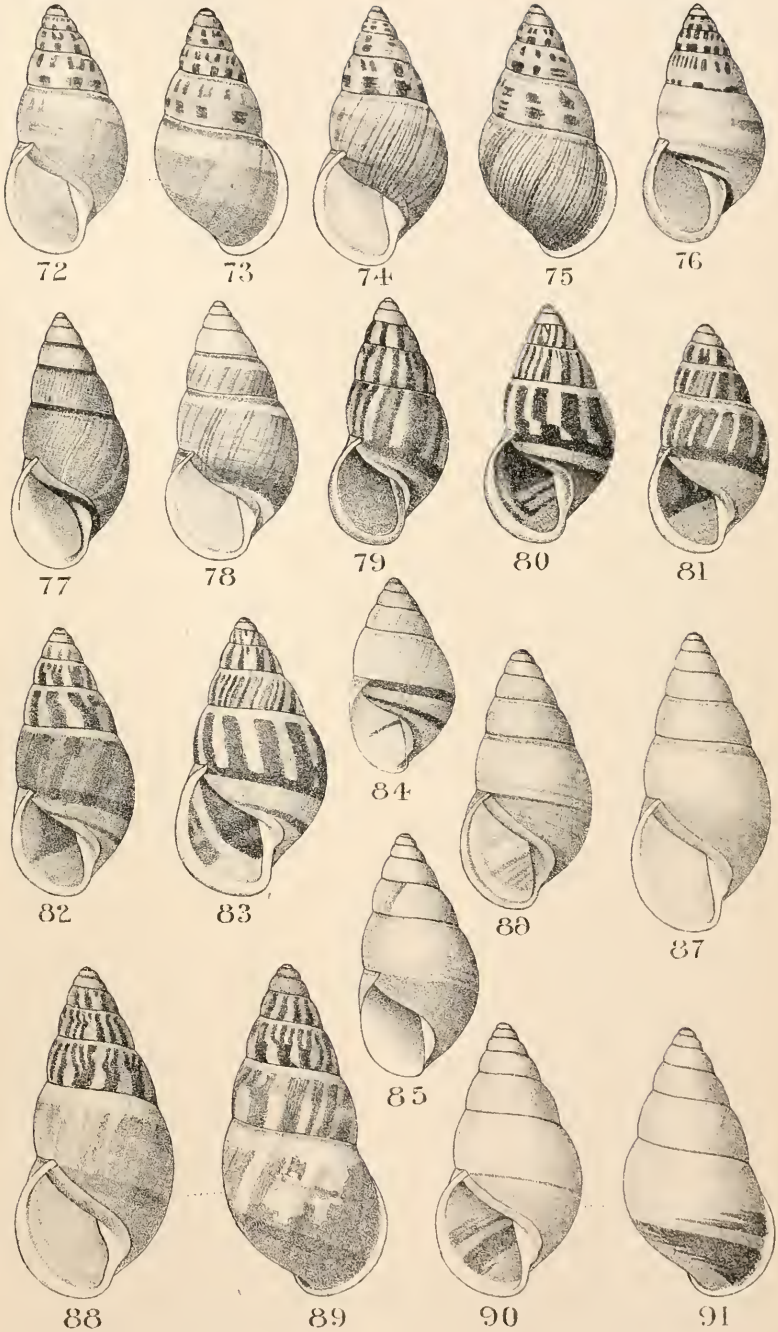
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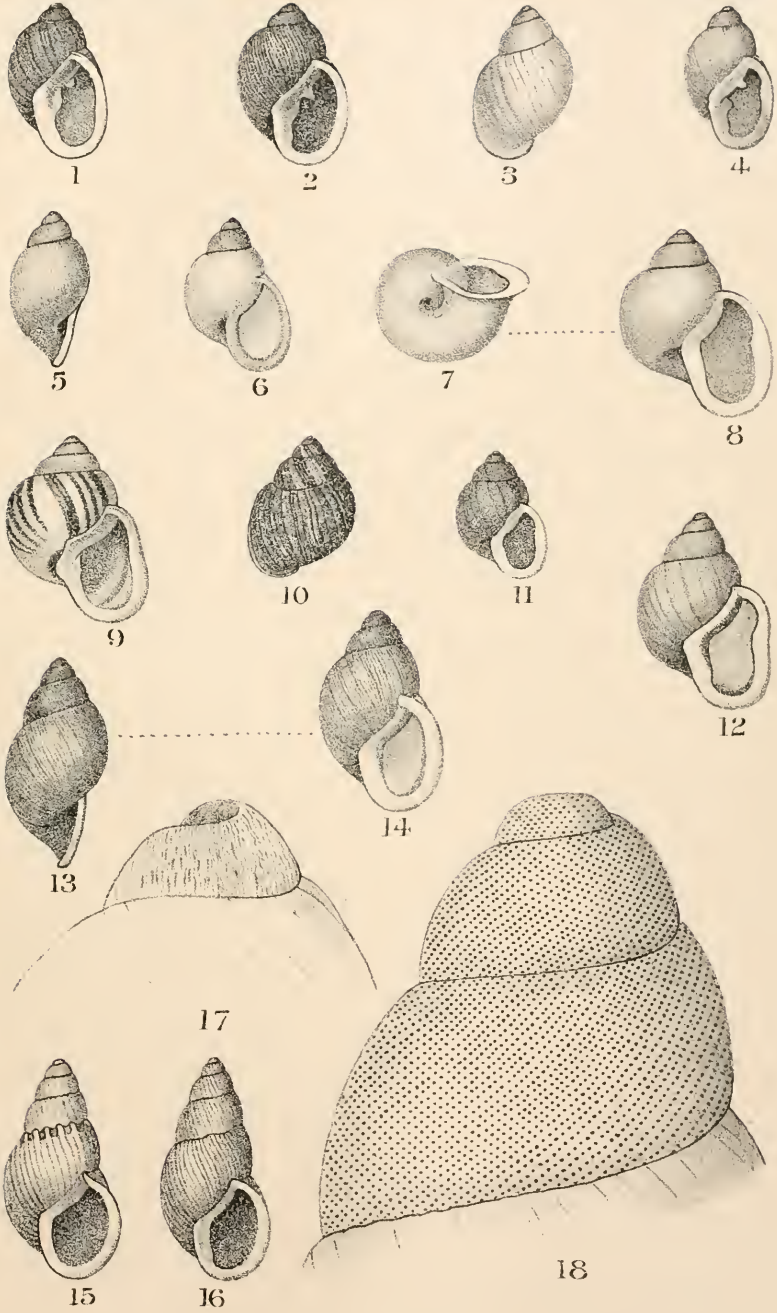
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